DATALOGIC™

MATRIX-2000™

Reference Manual

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Matrix-2000™ Reference Manual

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CONTENTS

REFERENCES

CONVENTIONS

This manual uses the following conventions:

"User" refers to anyone using a Matrix-2000™ reader.
"Reader" refers to the Matrix-2000™ reader.
"You" refers to the System Administrator or Technical Support person using this manual to install, configure, operate, maintain or troubleshoot a Matrix-2000™ reader.

REFERENCE DOCUMENTATION

For further details refer to: the VisiSet™ Help On Line, Matrix Reading Methods, Matrix Host Mode Programming, Matrix SW Parameter Guide, Matrix Symbol Verifier Solution provided as supplementary documentation on CD-ROM.

SERVICE AND SUPPORT

Datalogic provides several services as well as technical support through its website. Log on to **www.automation.datalogic.com** and click on the links indicated for further information including:

- **PRODUCTS**

  Search through the links to arrive at your product page where you can download specific **Manuals** and **Software & Utilities**

  - **VisiSet™** a utility program, which allows device configuration using a PC. It provides RS232 and Ethernet interface configuration.

- **SERVICES & SUPPORT**

  - **Datalogic Services -** Warranty Extensions and Maintenance Agreements
  - **Authorised Repair Centres**

- **CONTACT US**

  E-mail form and listing of Datalogic Subsidiaries

PATENTS

This product is covered by one or more of the following patents:

U.S. patents: 6,512,218 B1; 6,616,039 B1; 7,102,116 B2; 7,282,688 B2
European patents: 999,514 B1; 1,014,292 B1.

Additional patents pending.

COMPLIANCE

For installation, use and maintenance it is not necessary to open the reader.

EMC COMPLIANCE

In order to meet the EMC requirements:

- connect reader chassis to the plant earth ground by means of a flat copper braid shorter than 100 mm;
- connect the main interface cable shield to pin 1 of the reader 25-pin connector;
- use two clip-on ferrite sleeves (type Stewart 28A2029-0A0) on the main interface cable near the reader 25-pin connector;
- connect the Ethernet interface cable shield to the reader chassis (for Matrix-21XX only).

POWER SUPPLY

ATTENTION: READ THIS INFORMATION BEFORE INSTALLING THE PRODUCT

This product is intended to be installed by Qualified Personnel only.

This product is intended to be connected to a UL Listed Computer which supplies power directly to the reader or a UL Listed Direct Plug-in Power Unit marked LPS or “Class 2”, rated 10 to 30 V, minimum 1 A.

LED CLASS

Class 1 LED Product to EN60825-1:2001

CE COMPLIANCE

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC COMPLIANCE

Modifications or changes to this equipment without the expressed written approval of Datalogic could void the authority to use the equipment.

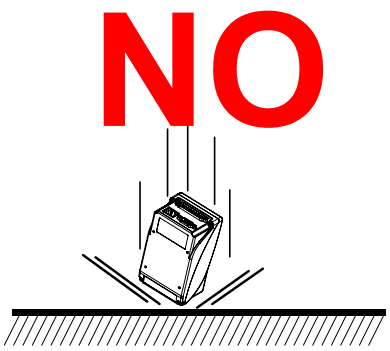
This device complies with PART 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference which may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

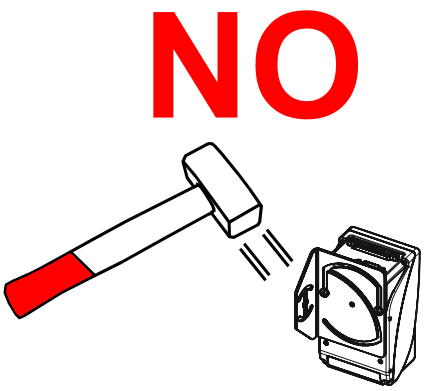
HANDLING

The Matrix-2000™ is designed to be used in an industrial environment and is built to withstand vibration and shock when correctly installed, however it is also a precision product and therefore before and during installation it must be handled correctly to avoid damage.

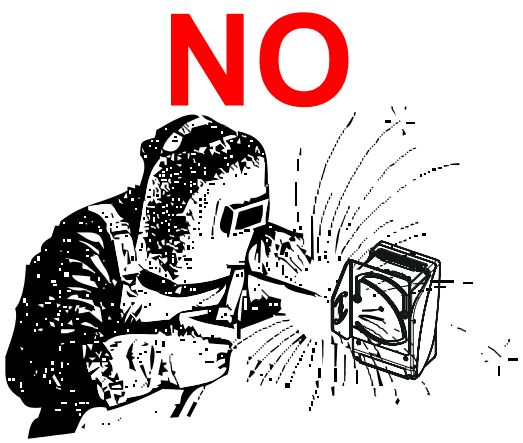
- avoid that the readers are dropped (exceeding shock limits).



- do not fine tune the positioning by striking the reader or bracket.



- do not weld the reader into position which can cause electrostatic, heat or reading window damage.



- do not spray paint near the reader which can cause reading window damage.

GENERAL VIEW

Matrix-2000™

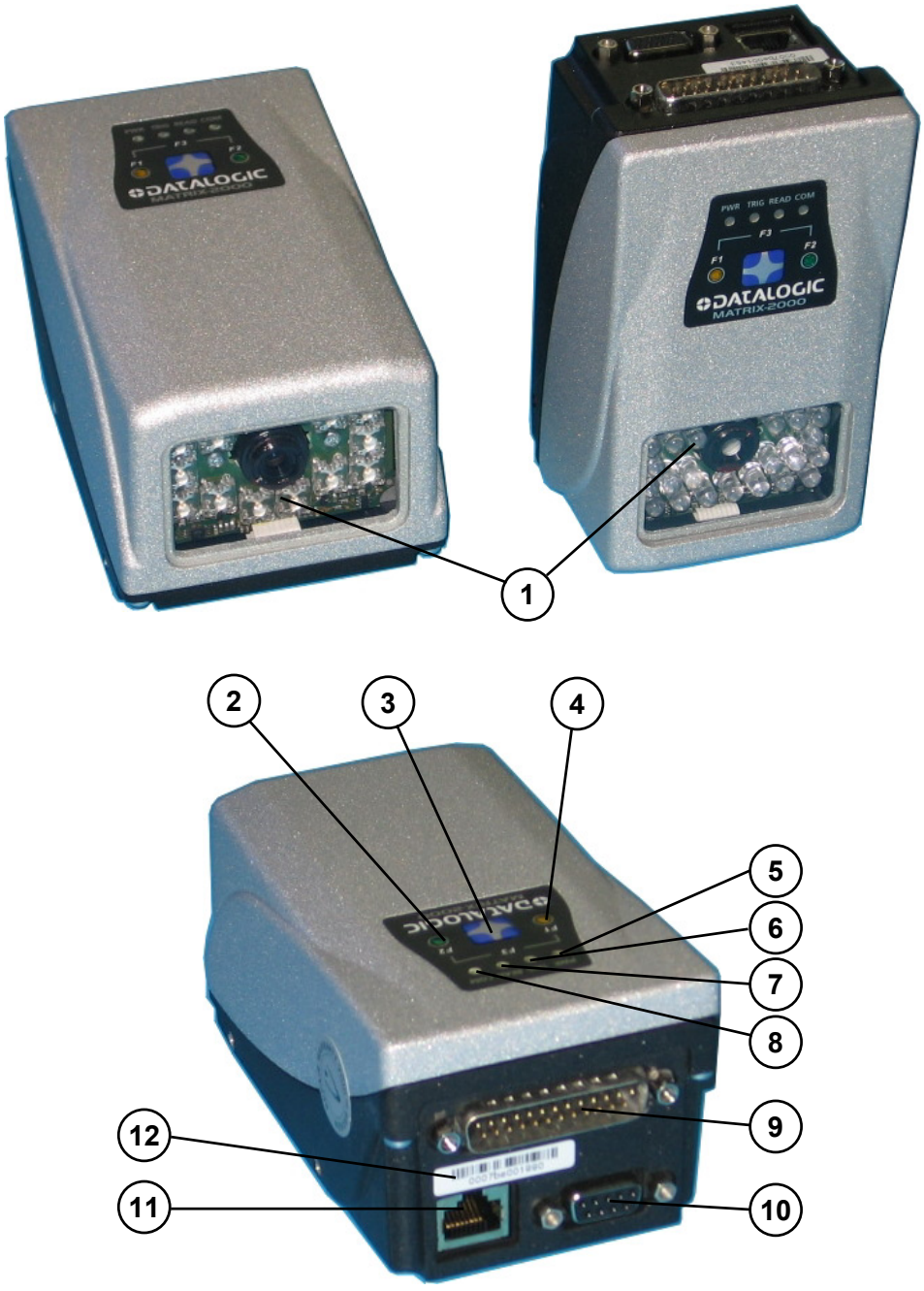


Figure A

1. Reading Window
2. F2 LED
3. Keypad button
4. F1 LED
5. Power On LED
6. External Trigger LED
7. Good Read LED
8. Communication LED
9. Main/Auxiliary Interface
10. Auxiliary Interface
11. Ethernet Interface (for 21XX models only)
12. Ethernet MAC Address

1 RAPID CONFIGURATION

STEP 1 – CONNECTING THE SYSTEM

To connect the system in a Stand Alone configuration, you need the hardware indicated in Figure 1. In this layout the data is transmitted to the Host on the main serial interface.

The RS232 auxiliary interface can be used for reader configuration by connecting a laptop computer running VisiSet™.

When One Shot or Phase Mode Operating mode is used, the reader is activated by an External Trigger (photoelectric sensor) when the object enters its reading zone.

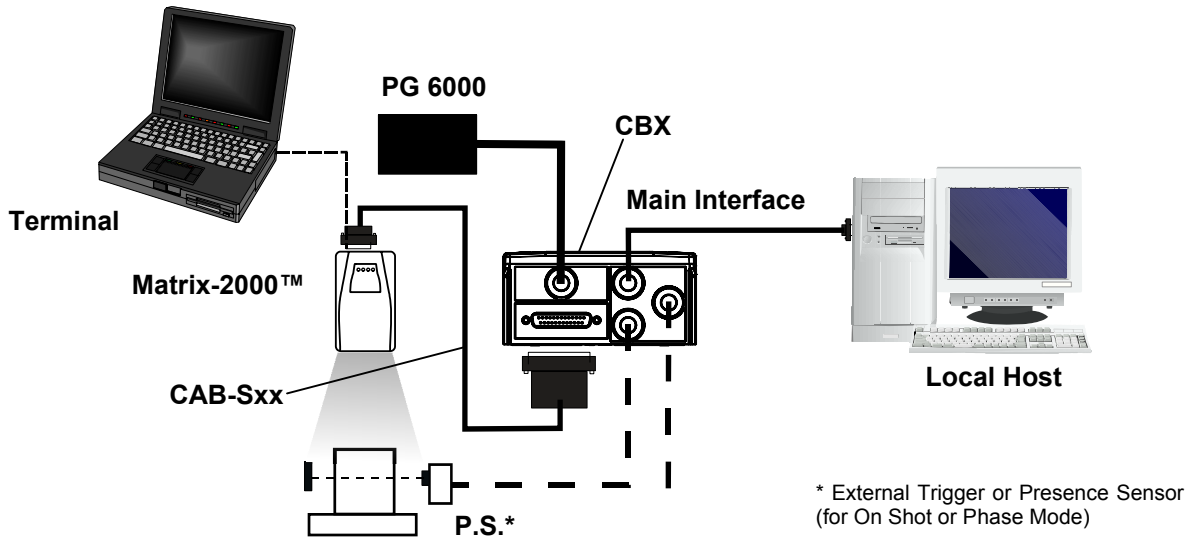


Figure 1 – Matrix-2000™ in Stand Alone Layout

CBX100/CBX500 Pinout for Matrix-2000™

The table below gives the pinout of the CBX100/CBX500 terminal block connectors. Use this pinout when the Matrix-2000™ reader is connected by means of the CBX100/CBX500:

CBX100/500 Terminal Block Connectors			
Input Power		**Outputs**	
Vdc	Power Supply Input Voltage +	+V	Power Source - Outputs
GND	Power Supply Input Voltage -	-V	Power Reference - Outputs
Earth	Protection Earth Ground	O1+	Output 1 +
		O1-	Output 1 -
Inputs		O2+	Output 2 +
+V	Power Source – External Trigger	O2-	Output 2 -
I1A	External Trigger A (polarity insensitive)	O3A	Output 3 + **(CBX500 only – polarity sensitive)**
I1B	External Trigger B (polarity insensitive)	O3B	Output 3 - **(CBX500 only – polarity sensitive)**
-V	Power Reference – External Trigger	**Auxiliary Interface**	
+V	Power Source – Inputs	TX	Auxiliary Interface TX
I2A	Input 2 A (polarity insensitive)	RX	Auxiliary Interface RX
I2B	Input 2 B (polarity insensitive)	SGND	Auxiliary Interface Reference
-V	Power Reference – Inputs	**Shield**	
		Shield	Network Cable Shield

Main Interface			
	RS232	**RS485 Full-Duplex**	**RS485 Half-Duplex**
	TX	TX+	RTX+
	RTS	TX-	RTX-
	RX	*RX+	
	CTS	*RX-	
	SGND	SGND	SGND

* Do not leave floating, see par. 4.2.2 for connection details.

CAUTION

Do not connect GND and SGND to different (external) ground references. GND and SGND are internally connected through filtering circuitry which can be permanently damaged if subjected to voltage drops over 0.8 Vdc.

CAUTION

If Matrix-2000™ is connected to a CBX with a BM100 Backup Module, then the Matrix-2000™ 9-pin Auxiliary port connector cannot be used for communication (i.e. configuration through VisiSet™). In this case use the Auxiliary port 9-pin connector inside the CBX.

DB25-Pin Connector

The Matrix-2000™ reader is equipped with a 25-pin male D-Sub connector for connection to the power supply and input/output signals. The details of the connector pins are indicated in the following table:

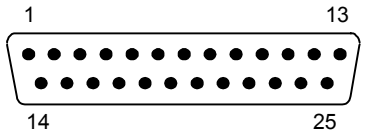


Figure 2 - 25-pin male D-Sub Connector

19-pin M16 male connector pinout				
Pin	**Name**	**Function**		
9, 13 23, 25 1	Vdc GND CHASSIS	Power supply input voltage + Power supply input voltage - Cable shield internally connected by capacitor to the chassis		
18 19 6 10	I1A I1B I2A I2B	External Trigger A (polarity insensitive) External Trigger B (polarity insensitive) Input 2 A (polarity insensitive) Input 2 B (polarity insensitive)		
8 22 11 12 16 17	O1+ O1- O2+ O2- O3+ O3-	Output 1 + Output 1 - Output 2 + Output 2 - Output 3 + Output 3 -		
20 21	RX TX	Auxiliary RS232 RX (referred to GND) Auxiliary RS232 TX (referred to GND)		
14, 15, 24	NC	Not connected		
Pin	**Name**	**RS232**	**RS485 Full-Duplex**	**RS485 Half-Duplex**
2 3 4 5 7	MAIN INTERFACE (SW SELECTABLE)	TX RX RTS CTS GND_ISO	TX+ *RX+ TX- *RX- GND_ISO	RTX+ RTX- GND_ISO

* Do not leave floating, see par. 5.5.2 for connection details.

In order to meet EMC requirements:

- connect the reader chassis to the plant earth ground by means of a flat copper braid shorter than 100 mm;
- connect the main interface cable shield to pin 1 of the 25-pin connector;
- use two clip-on ferrite sleeves (type Stewart 28A2029-0A0 or equivalent) on the main interface cable near the reader 25-pin connector;
- connect the Ethernet interface cable shield to reader chassis (for Matrix-21XX only)

DB9-Pin Connector (RS232 Auxiliary Port)

There is also a separate 9-pin female D-sub connector for the Auxiliary port connection with the following pinout:

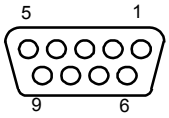


Figure 3 - 9-pin female D-Sub Connector

9-pin female D-sub connector pinout		
Pin	**Name**	**Function**
2	TX	Transmitted data of auxiliary RS232
3	RX	Received data of auxiliary RS232
5	GND	Reference GND of auxiliary RS232
1,4,6,7,8,9	N.C.	Not connected

CAUTION

If Matrix-2000™ is connected to a CBX with a BM100 Backup Module, then the Matrix-2000™ 9-pin Auxiliary port connector cannot be used for communication (i.e. configuration through VisiSet™). In this case use the Auxiliary port 9-pin connector inside the CBX.

RJ45 8-Pin Connector (Ethernet)

In Matrix-21XX models a RJ45 Modular Jack is provided for Ethernet connection. This interface and the connector pinout (see the following table) are IEEE 802.3 10 BaseT and IEEE 802.3u 100 BaseTx compliant. See par. 5.7 for connection details.

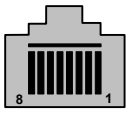


Figure 4 - RJ45 Modular Jack

RJ45 modular jack pinout		
Pin	**Name**	**Function**
1	TX +	Transmitted data (+)
2	TX -	Transmitted data (-)
3	RX +	Received data (+)
6	RX -	Received data (-)
4,5,7,8	N.C.	Not connected

STEP 2 – MOUNTING AND POSITIONING THE SYSTEM

1. To mount the Matrix-2000™, use the mounting bracket to obtain the most suitable position for the reader as shown in the figures below.

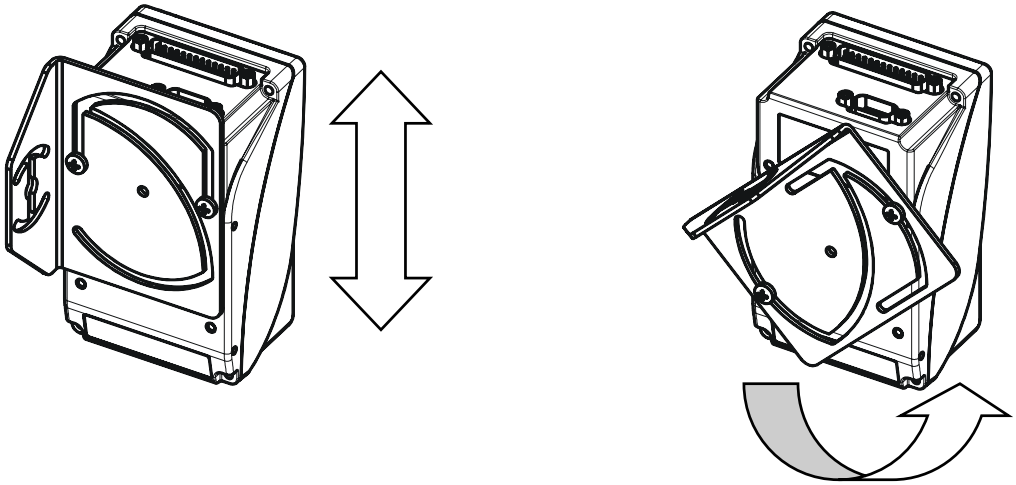
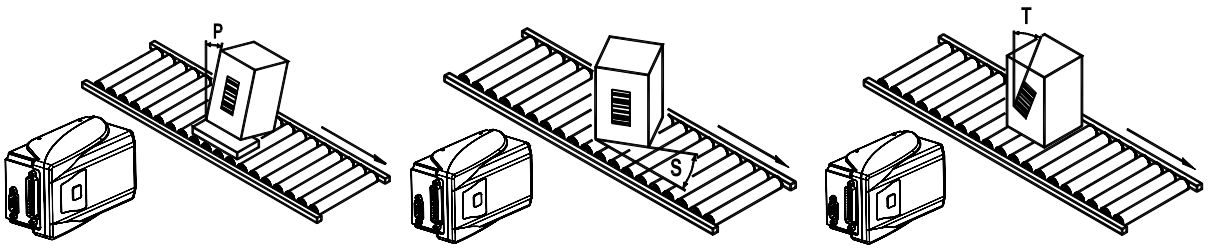


Figure 5 - Positioning with Mounting Bracket

2. When mounting the Matrix-2000™ take into consideration these three ideal label position angles: **Pitch or Skew 10° to 20°** and **Tilt 0°**, although the reader can read a code at any Tilt angle.



Minimize **Assure at least 10°** **Minimize**

Figure 6 – Pitch, Skew and Tilt Angles

3. Refer to the Reading Features in chp. 7 to determine the distance your reader should be positioned at.

STEP 3 – AUTOLEARNING CONFIGURATION

An autolearning procedure is available to reduce installation time.

Status and diagnostic information are clearly presented by means of four colored LEDs, whereas the single push button and F1 and F2 LEDs give immediate access to the following relevant functions:

- *Positioning (F1)* gives visual feedback from the F1 LED to help center the code in the reader's FOV without external tools or software programs
- *Auto Learn (F2)* to self-detect and auto-configure calibration and code setting parameters
- *Restore Default (F3)* to return to factory default settings

The colors and meaning of the four status LEDs are illustrated in the following table:

PWR (red)	This LED indicates the device is powered
TRIG (yellow)	This LED indicates the external trigger activity
READ (red)	This LED confirms successful reading. It is also used to signal successful startup. At power on this LED turns on and after a few seconds turns off. If the startup is not successful, this LED remains on.
COM (green)	This LED indicates active communication on the main serial port (Ethernet port for 21xx models). This LED is also software configurable.

Auto Learn

If you are configuring your reader using the *Auto Learn* procedure:

1. Place the desired code in front of the reader at the correct reading distance (depending on the model, see the Reading Features table in chp **7**).
2. Enter the *Auto Learn* function *(F2)* by pressing and holding the push button until only the F2 LED is on: Matrix-2000™ also beeps twice.
3. Release the button to enter the *Auto Learn* function.
   Once entered, the reader acquires an image and automatically configures the optimal Exposure Time and Gain parameters for static reading, as well as detecting and recognizing the code, which is presented to it. The F2 LED blinks during this process.
4. At the end of the procedure, the new configuration parameters will be stored to permanent memory, the F2 LED remains on continuously and then the function automatically exits, the F2 LED turns off. Matrix-2000™ also emits 3 high pitched beeps.

If the Auto Learn calibration cannot be reached within a short timeout (max. 1 minute), Matrix-2000™ will exit without saving the configuration parameters, the F2 LED will not remain on continuously but it will just stop blinking. In this case, Matrix-2000™ emits a long low pitched beep.

To cancel the Auto Learn function without saving the configuration parameters, press and hold the keypad button at any time during the procedure: the F2 LED will stop blinking and Matrix-2000™ will emit a long low pitched beep.

NOTE

Autolearning configuration parameters can be saved to temporary memory only by selecting the "Autolearning Setup>Store Memory" parameter in VisiSet™.

The Autolearning function on the keypad button can also be disabled by the user via VisiSet™.

Auto Learn (F2) green

Figure 7 – Auto Learn Function

Repeat the procedure if needed, to program different code symbologies, however you must present only one code at a time to the reader.

Matrix-2000™ is able to decode any code symbology in its library with this procedure.

NOTE

If your application has been configured using Auto Learn, your reader is ready. If necessary you can use VisiSet™ for advanced reader configuration.

Positioning (Optional)

At the end of the *Auto Learn* procedure, you can use the *Positioning* procedure to center the code with respect to the reader's FOV.

1. While the desired code is in front of the reader at the correct reading distance, enter the *Positioning* function *(F1)* by pressing and holding the push button until only the F1 LED is on: Matrix-2000™ also beeps once.
2. Release the button to enter the Positioning function.
   Once entered, the reader continuously acquires images and gives visual feedback using the F1 LED to indicate when the code is centered with respect to the reader's FOV. Slow blinking means that the positioning value must be improved.
3. To obtain the best value in terms of positioning, move the code and/or the reader so as to position the code as close as possible to the center of the Field of View, keeping the correct focus distance. Check F1 LED blinking: the best code positioning corresponds to fast (almost continuous) blinking.
4. After a short timeout the function automatically exits, the F1 LED remains on continuously and then stops blinking. Matrix-2000™ also emits 3 high pitched beeps.

If no valid code is present in the FOV, after about 3 minutes, Matrix-2000™ will automatically exit, the F1 LED will not remain on continuously but it will just stop blinking. In this case, Matrix-2000™ emits a long low pitched beep.

To cancel the Positioning function, press and hold the keypad button at any time during the procedure: the F1 LED will stop blinking and Matrix-2000™ will emit a long low pitched beep.

Figure 8 – Positioning Function

Restore Default (Optional)

At any time you can use the *Restore Default* procedure to return the reader to the factory default settings.

1. Enter the *Restore Default* function *(F3)* by pressing and holding the push button until both the F1 and F2 LEDs are on: Matrix-2000™ also beeps three times.
2. Release the button to perform the *Restore Default* function.

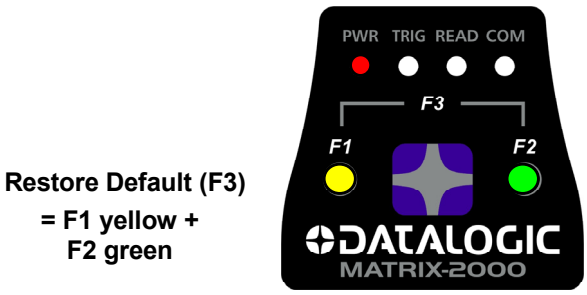


Figure 9 – Restore Default Function

STEP 4 – INSTALLING VISISET™ CONFIGURATION PROGRAM

VisiSet™ is a Datalogic reader configuration tool providing several important advantages:

- Autolearning Wizard for rapid configuration and for new users;
- Defined configuration directly stored in the reader;
- Communication protocol independent from the physical interface allowing to consider the reader as a remote object to be configured and monitored.

To install VisiSet™, turn on the PC that will be used for the configuration, running Windows 98, 2000/NT, XP or Vista, then insert the VisiSet™ CD-ROM, wait for the CD to autorun and follow the installation procedure.

This configuration procedure assumes a laptop computer, running VisiSet™, is connected to the reader's auxiliary port.

After installing and running the VisiSet™ software program the following window:

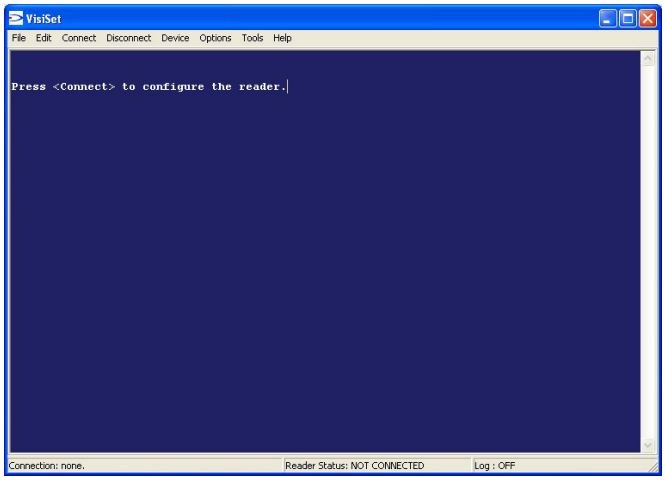


Figure 10 - VisiSet™ Opening Window

Set the communication parameters from the "Options" menu. Then select "Connect", the following window appears:

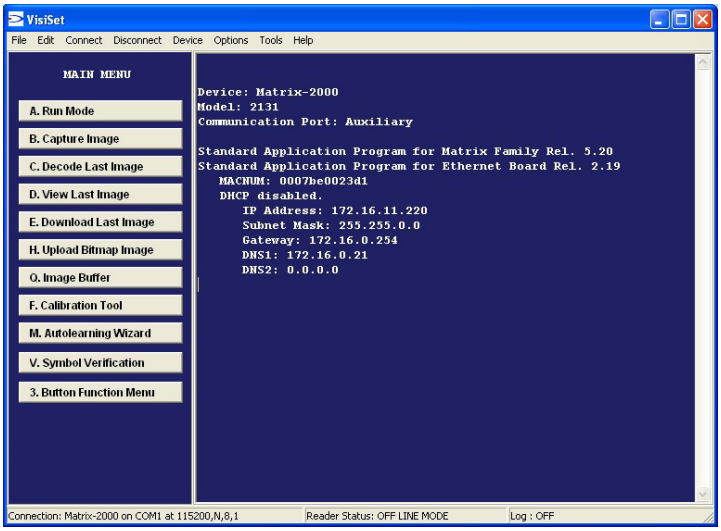
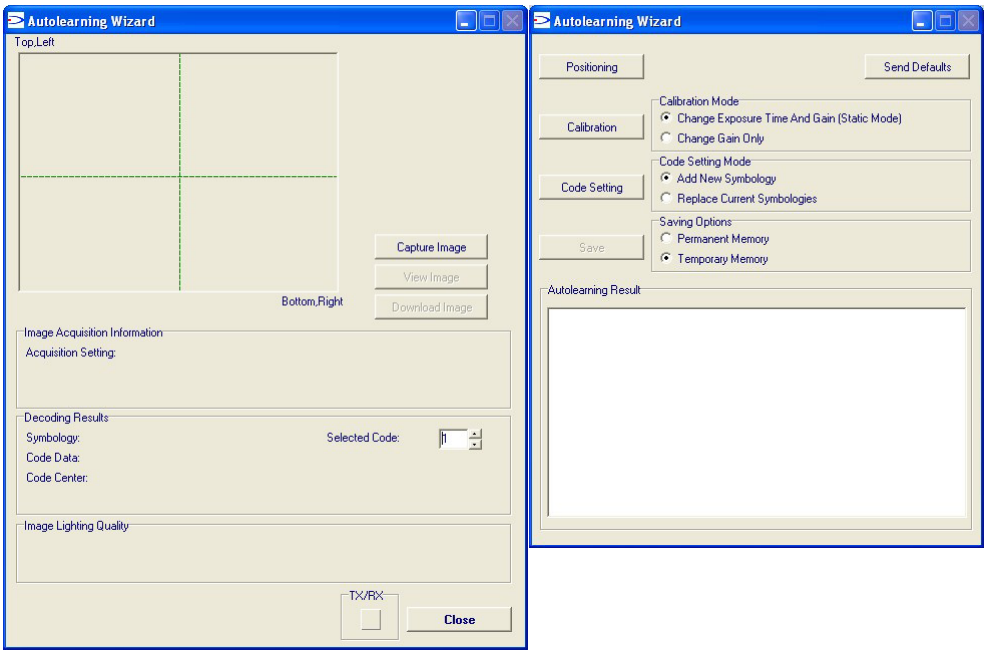


Figure 11 - VisiSet™ Main Window After Connection

The Autolearning Wizard option is advised for rapid configuration or for new users. It allows reader configuration in a few easy steps.

STEP 5 – CONFIGURATION USING AUTOLEARNING WIZARD

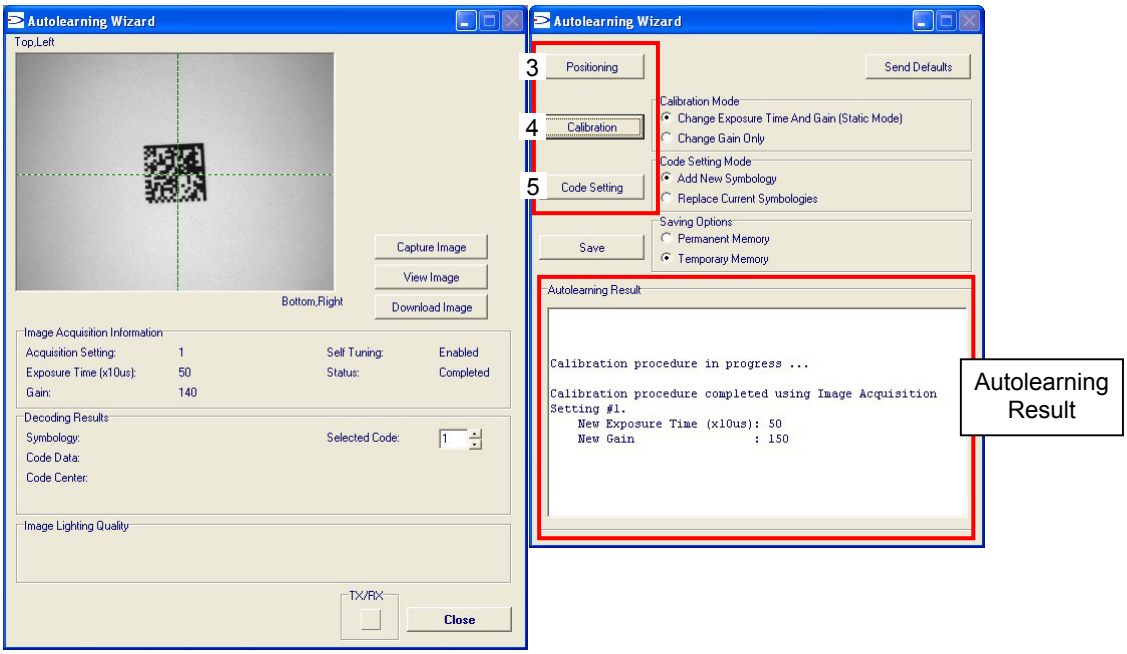
1. Select the Autolearning Wizard button from the Main menu.



2. Place the desired code in front of the reader at the correct reading distance (depending on the model, see the Reading Features table in par. 7.1).

3. Press the "Positioning" button. The reader continuously acquires images and gives visual feedback in the view image window to indicate when the code is centered with respect to the reader's FOV. Move the reader (or code) to center it. Press the Positioning button again to stop positioning.

4. Select a Calibration Mode choice and press the "Calibrate" button.

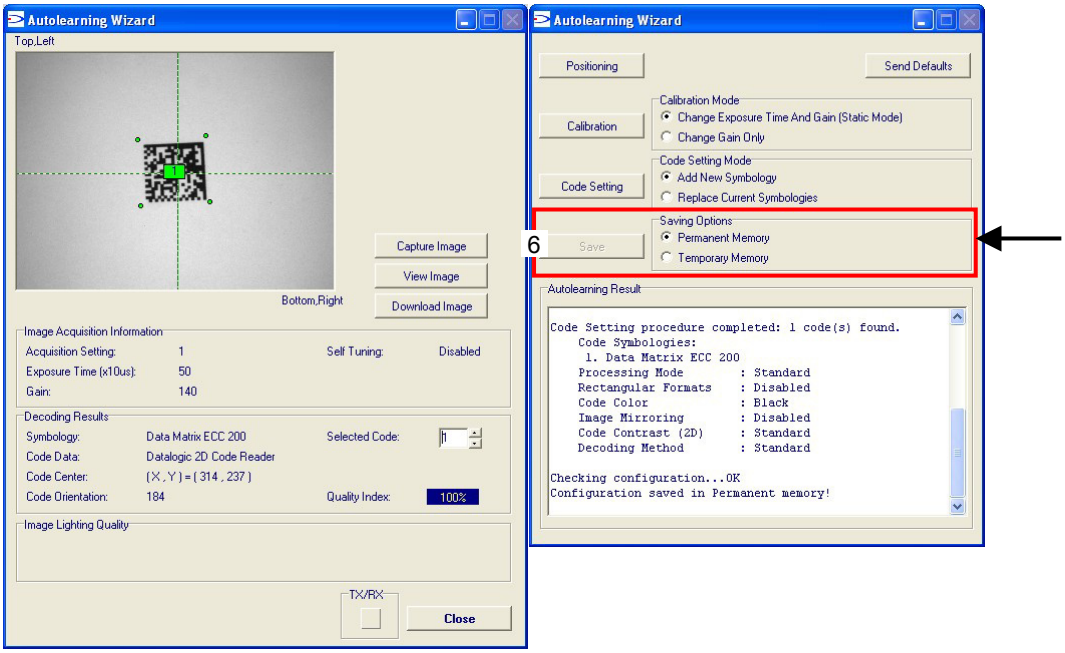


The reader flashes once acquiring the image and auto determines the best exposure and gain settings. If the code symbology is enabled by default, the code will also be decoded.

5. If the code symbology is not enabled by default, select a Code Setting Mode choice and press the "Code Setting" button.

The Autolearning Result section of the Autolearning Wizard window shows the parameter settings and the code type results.

6. Select a Saving Options choice and press the "Save" button.



7. Close the AutoLearning Wizard.

NOTE

If your application has been configured using the VisiSet™ Autolearning Wizard, your reader is ready. If necessary you can use VisiSet™ for advanced reader configuration.

ADVANCED READER CONFIGURATION

For further details on advanced product configuration, refer to the VisiSet™ Help On-Line.

The following are alternative or advanced reader configuration methods:

Advanced Configuration Using VisiSet™

Advanced configuration can be performed through the VisiSet™ program by selecting *Device> Get Configuration From Temporary Memory* to open the Parameter Setup window in off-line mode. Advanced configuration is addressed to expert users being able to complete a detailed reader configuration. The desired parameters can be defined in the various folders of the Parameter Setup window and then sent to the reader memory (either Temporary or Permanent):

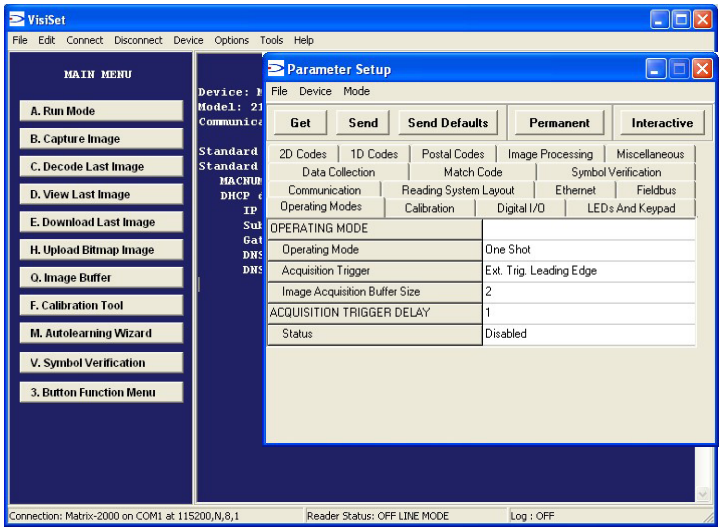


Figure 12 - VisiSet™ Parameter Setup Window

Host Mode Programming

The reader can also be configured from a host computer using the Host Mode programming procedure, by commands via the serial interface. See the Host Mode Programming file on the CD-ROM.

Alternative Layouts

If you need to install an Ethernet network, Pass-Through network, Multiplexer network or an RS232 Master/Slave refer to chp. 6.

Code Quality Verification

Matrix-2000™ can be used as a Code Quality Verifier according to the ISO/IEC 15415, ISO/IEC 15416, AS9132, and AIM DPM Standards. For more details see the Matrix-2000™ Code Quality Verifier Solution manual on the CD-ROM.

2 GENERAL FEATURES

2.1 INTRODUCTION

Matrix-2000™ is a Datalogic compact 2D reader designed and produced to be a high performance affordable solution for both linear and two-dimensional code reading applications. Matrix-2000™ has been developed for use in numerous applications, including PCB and electronic manufacturing, packaging lines, small item tracking, analysis machines and document handling systems, and can also be easily integrated into a wide range of OEM solutions.

Matrix-2000™ uses imaging technology and provides complete reading system functions by integrating: lighting system, image acquisition, image processing, decoding and communication into a single compact unit.

This technology intrinsically provides omni-directional reading.

Standard Application Program

A Standard Application Program is factory-loaded onto Matrix-2000™. This program controls code reading, data formatting, serial port and Ethernet interfacing, and many other operating and control parameters. It is completely user configurable from a Laptop or PC using the dedicated configuration software program VisiSet™, provided on CD-ROM with the reader.
There are different programmable operating modes to suit various code reading system requirements.

Quick, automatic calibration and positioning of the reader can be accomplished using the Autolearning button and LEDs on top of the reader without the necessity of a PC.

Autolearning can also be performed through VisiSet™ through the Autolearning Wizard. This tool includes visual feedback from the reader.

VisiSet™ provides a Calibration Tool to verify the exact positioning of the reader and to maximize its reading performance.

Statistics on the reading performance can also be visualized through a dedicated window in VisiSet™.

Symbol Verification can be performed through VisiSet™ when the reader has been installed and setup as a Verifier station. For details see the Matrix Symbol Verifier Solution manual.

Programmability

If your requirements are not met by the Standard Application Program, Custom Application Programs can be requested at your local Datalogic distributor.

2.2 DESCRIPTION

Some of the main features of this reader are given below:

- Decoding of most popular linear and stacked barcodes, 2D code symbologies and postal codes
- Omni-directional reading
- Direct or 90° reading Window
- Quick installation without PC by using Autolearning button and F1, F2 LEDs
- Image Windowing function
- Frame rate up to 60 frames/sec (3600 frames/min)
- Up to 200 readable codes in the same reading phase
- Calibration Tool to verify exact code positioning in the Field of View and to maximize the reading performance
- Ethernet interface (Matrix-21XX only) with TCP/IP socket for reader parameter configuration, data and image transfer, HTTP server, FTP and mail client, etc.
- Windows-based VisiSet™ software to configure the reader parameter via PC serial or Ethernet interface
- Code quality assessment according to ISO/IEC 16022, ISO/IEC 18004, ISO/IEC 15415, ISO/IEC 15416 and AS9132 and AIM DPM standards.
- Different operating modes to suit various application requirements
- User-defined database of Image Acquisition Settings (parameter sets)
- Match Code option with a user-defined match code database
- Diagnostic software tools
- 2 serial communication interfaces
- General purpose optocoupled I/Os
- Supply voltage ranges from 10 to 30 Vdc

The reader is contained in a magnesium alloy housing; the mechanical dimensions are 121 x 73 x 57 mm and it weighs about 380 g.

The protection class of the enclosure is IP64 for all 20XX models; therefore the reader is particularly suitable for industrial environments where protection against harsh external conditions is required.

Electrical connection of Power, Host interfaces and I/O signals is provided through a 25-pin connector (see Figure A, 9). In addition there is a 9-pin Auxiliary interface connector for reader configuration (see Figure A, 10). A standard Ethernet RJ45 connector is present on Matrix-21XX models (see Figure A, 11).

The following indicators are located on the top of the reader:

PWR red LED indicates that the reader is connected to the power supply (see Figure A, 5).

TRIG yellow LED indicates external trigger activity (Figure A, 6).

READ red LED signals successful code decoding (Figure A, 7).
It is also used to signal successful startup. At power on this LED turns on and after a few seconds turns off. If the startup is not successful, this LED remains on.

COM green LED is software configurable. As default it indicates: data transmission on the main serial interface for Matrix-20XX models; Ethernet interface external connection for Matrix-21XX models (Figure A, 8).

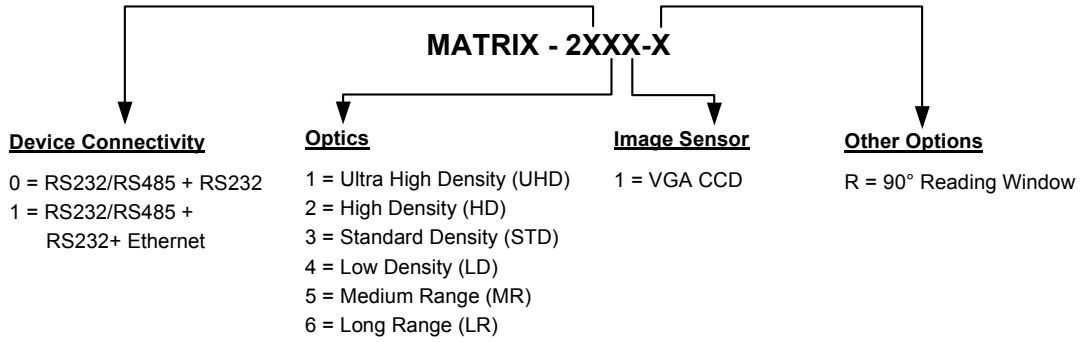
F1 yellow LED signals distance of code from the center of FOV during the Positioning (Optional) procedure. The faster it blinks, the better Matrix-2000™ is positioned (see Figure A, 4).

F2 green LED signals reader calibration with respect to image quality during the Auto Learn procedure (see Figure A, 2).

The keypad button is software programmable. By default it starts the Auto Learn or Positioning procedure to calibrate and position the reader for quick installation without using a PC (see Figure A, 3).

2.3 MODEL DESCRIPTION

The Matrix-2000™ reader is available in different versions according to the following characteristics:



2.4 ACCESSORIES

Order No.	Accessory	Description
93A051351	CAB-S01	Cable to CBX (1 m)
93A051352	CAB-S02	Cable to CBX (2 m)
93A051353	CAB-S05	Cable to CBX (5 m)
93A051354	CAB-S10	Cable to CBX (10 m)
93A301067	CBX100	Compact Connection Box
93A301069	CBX100LT	Compact Connection Box Low Temp
93A301068	CBX500	Modular Connection Box
93ACC1808	BM100	Backup Module for CBX100/500
93ACC1809	* BM150	Display Module for CBX500
93ACC1810, 93ACC1811	* BM300/BM310	Profibus Module STD/IP65 for CBX500
93ACC1814	* BM400	DeviceNet Module IP65 for CBX500
93ACC1718	PG6002	AC/DC Power Supply Unit (US)
93ACC1719	PG6001	AC/DC Power Supply Unit (UK)
93ACC1720	PG6000	AC/DC Power Supply Unit (EU)
93ACC1790	LTC-630	Four Bar Lighting System Controller
93ACC1791	PH-1	Photocell Kit PNP
93ACC1728	MEP- 543	Photocell Kit NPN
93A401003	LT-100	Cone Lighting System
93A401004	LT-200	Spot Lighting System
93A401012	LT-210	Mini-Spot Lighting System
93A401008	LT-300	Ring Lighting System
93A401013	LT-314	45° Dark Field Ring Lighting System
93A401014	LT-316	60° Dark Field Ring Lighting System
93A401015	LT-410	Coaxial Lighting System
93A401016	LT-510	Mini-Dome Lighting System
93A401017	LT-511	Dome Lighting System
93A401018	LT-630	Four Bar Lighting System
93ACC1786	BK-410	Coaxial Lighting System Bracket
93ACC1787	BK-510	Mini-Dome Lighting System Bracket
93ACC1788	BK-511	Dome/Ring Lighting System Bracket
93ACC1789	BK-630	Four Bar Lighting System Bracket
93ACC1729	USX-60	Adjustable Bracket
93A201090	GFC-MATRIX-2000	90° Deflection Mirror
93ACC1841	ISO/IEC Calibration Chart	Calibration Chart for Code Verifier Solution

* Accessories compatible with Matrix-2000™ application software 5.20 and later.

2.5 APPLICATION EXAMPLES

Matrix-2000™ is profitably used in the omnidirectional reading of 2D, stacked, linear and postal codes. The powerful LED illuminator, the Matrix 2XX1 60 fps CCD sensor and the 400 MHz CPU allow the decoding of fast moving codes (over 6.0 m/s) on industrial printing lines (see Figure 13) and in automated document handling and mail processing systems (see Figure 14).

Figure 13 - Matrix-2000™ Reading Station on a High Speed Printing Line

Figure 14 - Address Coded in Data Matrix Symbology for Automated Mail Processing

Matrix-2000™ assures the reading of deformed and / or overprinted codes, even though damaged or printed on high reflective surfaces (see Figures 15,16,17).

Figure 15 - Unidose Flow-Pack with PDF417 Code

Figure 16 - Overprinted Barcode Readable by Matrix-2000™ also Through the Envelope Window Film

Figure 17 - Barcode Printed on Curved Surface Readable by Matrix-2000™ in spite of Image Optical Distortion

Matrix-2000™ is also very powerful in reading low-contrast direct part marked codes (see Figures 18, 19, 20, 21 and 22).

Figure 18 - Dot Matrix Code Directly Marked on Metal Surface by Using Dot Peening Technology

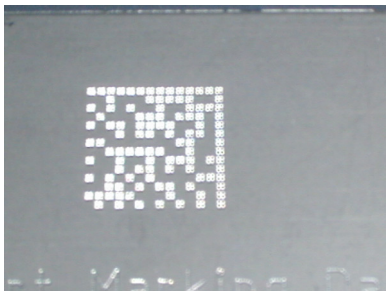


Figure 19 - Dot Peening Marking on Metal Surface with Multi-dot per Code Element

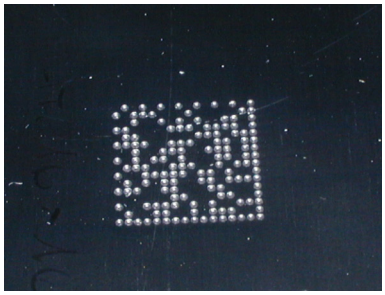


Figure 20 - Directly Marked Dot Matrix Code Characterized by Outstanding Separation Distance between Adjacent Code Elements

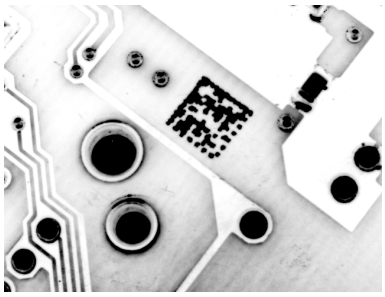


Figure 21 - Data Matrix Code Directly Marked on PCB Surface by Using Laser Etching Technology

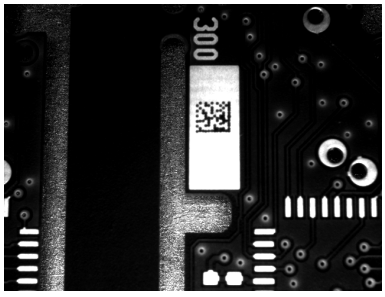


Figure 22 - Dot Matrix Code Directly Marked on PCB Copper Pad by Using Ink-Jet Technology

2.6 EXTERNAL LIGHTING SYSTEMS

In some direct part marking applications best reading results are obtained by using an external lighting system. A series of accessory illuminators are available which cover a variety of applications.

The LT-100 Cone Lighting System provides a circular symmetrical light source designed for the following applications:

- with uneven or noisy background surfaces
- where dot peening or laser etching codes are directly marked onto metal surfaces or PCBs and need to be highlighted
- in the presence of highly reflective surfaces (metal, glass, etc.) causing direct reflections

Figure 23 - LT-100 Cone Lighting System

The LT-200 Spot Lighting System provides a high intensity light source designed for the following applications:

- with uneven, noisy and scratched surfaces
- where dot peening or laser etching codes are directly marked onto metal surfaces or PCBs and need to be highlighted. Here the use of more than one Spot Light can remove any shadowing effect.
- in the presence of highly reflective surfaces (metal, glass, etc.) causing direct reflections. Low light path to surface angles strongly reduce direct reflections.

Figure 24 - LT-200 Spot Lighting System

The LT-210 Mini Spot Lighting System provides a high intensity light source designed for the following applications:

- with uneven, noisy and scratched surfaces
- where dot peening or laser etching codes are directly marked onto metal surfaces or PCBs and need to be highlighted. Here the use of more than one Spot Light can remove any shadowing effect.
- in the presence of highly reflective surfaces (metal, glass, etc.) causing direct reflections. Low light path to surface angles strongly reduce direct reflections.

Figure 25 - LT-210 Mini Spot Lighting System

The LT-300 Ring Lighting System is designed for reading codes produced by Dot Peening or Laser Etching on flat, reflective parts.

Figure 26 - LT-300 Ring Lighting System

The LT-314 45° Dark Field Ring Lighting System is designed for reading codes produced by Dot Peening or Laser Etching on flat, reflective parts.

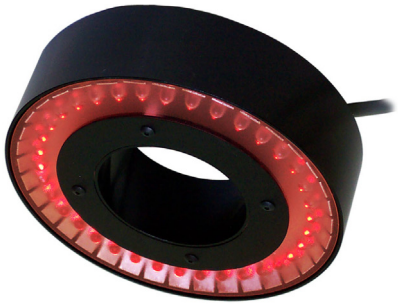


Figure 27 - LT-314 45° Dark Field Ring Lighting System

The LT-316 60° Dark Field Ring Lighting System is designed for reading codes produced by Dot Peening (especially by a 120° stylus) or Laser Etching on flat, reflective parts.

Figure 28 - LT-316 60° Dark Field Ring Lighting System

The LT-410 Coaxial Lighting System is an axial diffuse illuminator designed for reading codes produced by Dot Peening or Laser Etching on flat parts having a matte, specular or mixed surface reflectivity.

Figure 29 - LT-410 Coaxial Lighting System

The LT-510 Mini Dome Lighting System is a diffuse mini dome light designed for reading printed label or Direct Marking codes on small parts with a curved or specular surface.

Figure 30 - LT-510 Mini Dome Lighting System

The LT-511 Dome Lighting System is a diffuse dome light designed for reading printed label or Direct Marking codes on parts with a curved surface.

Figure 31 - LT-511 Dome Lighting System

The LT-630 Four Bar Lighting System is designed for Code verification applications according to ISO/IEC 15415 or ISO/IEC 15416 specifications.

Figure 32 - LT-630 Four Bar Lighting System

3 INSTALLATION

3.1 PACKAGE CONTENTS

Verify that the Matrix-2000™ reader and all the parts supplied with the equipment are present and intact when opening the packaging; the list of parts includes:

- ❑ Matrix-2000™ reader
- ❑ Quick Reference Guide
- ❑ Test Chart
- ❑ Matrix family CD-ROM
- ❑ Auxiliary port connector cover
- ❑ Mounting kit
  - Mounting screws and washers (4 ea.)
  - Mounting bracket

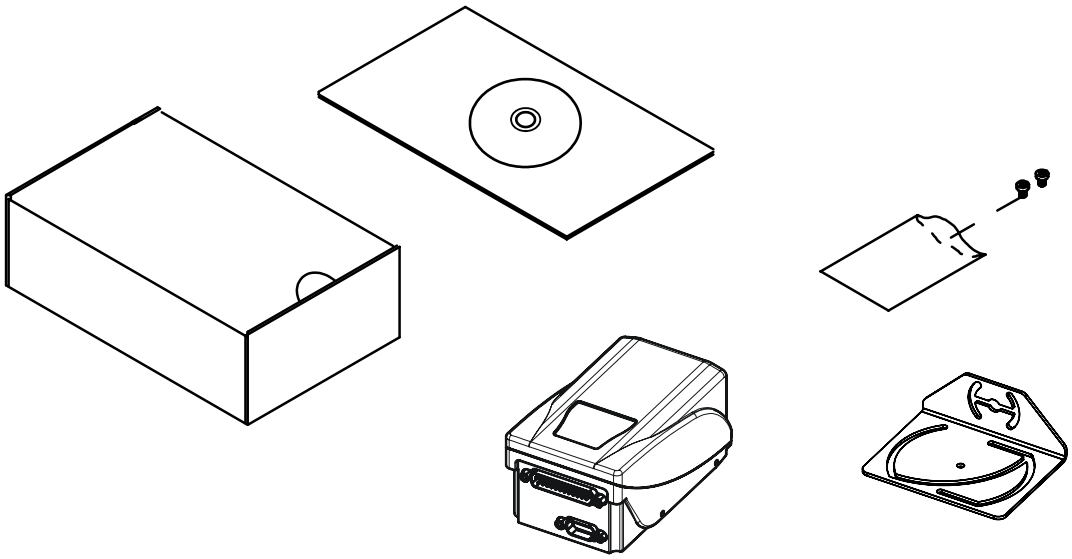


Figure 33 - Package Contents

3.2 MECHANICAL DIMENSIONS

Matrix-2000™ can be installed to operate in different positions. The eight screw holes (M4 x 5) on the body of the reader are for mechanical fixture (Figure 34).

The diagram below gives the overall dimensions of the reader and may be used for its installation.

Refer to paragraphs 3.3 and 7.1 for correct positioning.

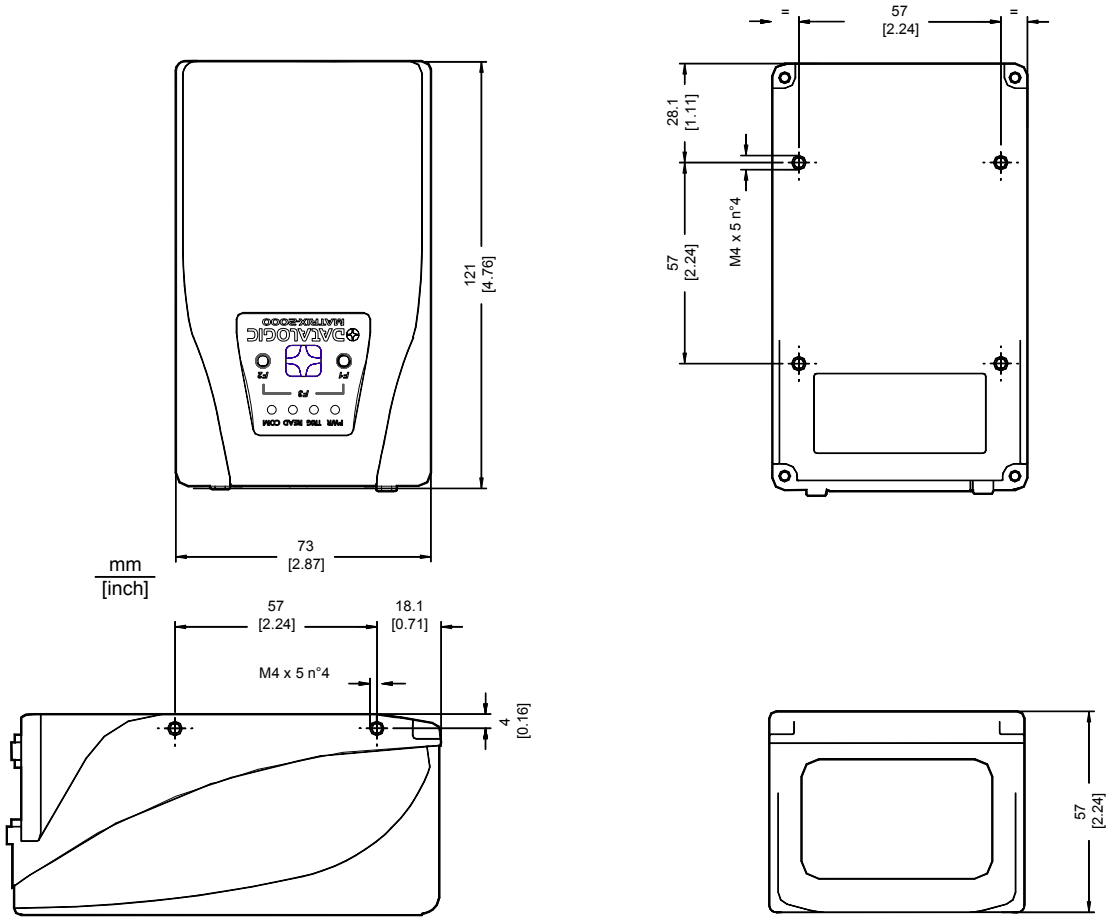


Figure 34 - Overall Dimensions

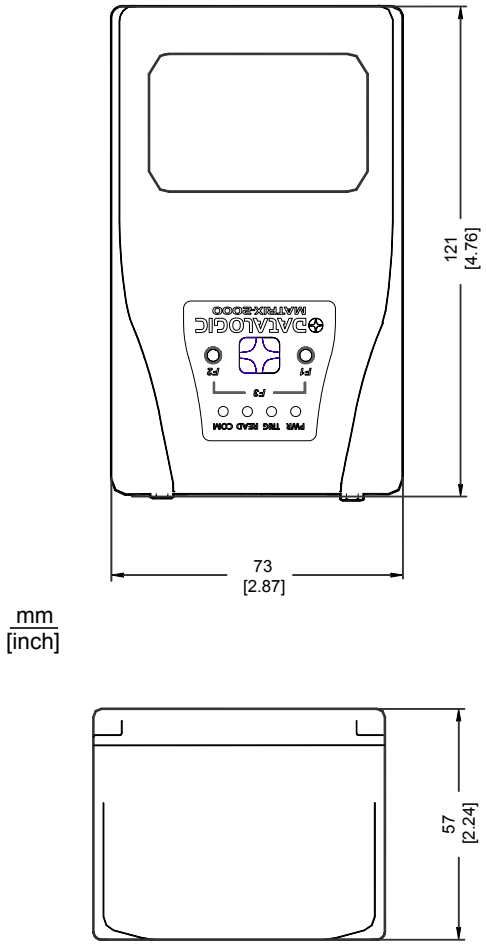


Figure 35 - Overall dimensions - 90° model

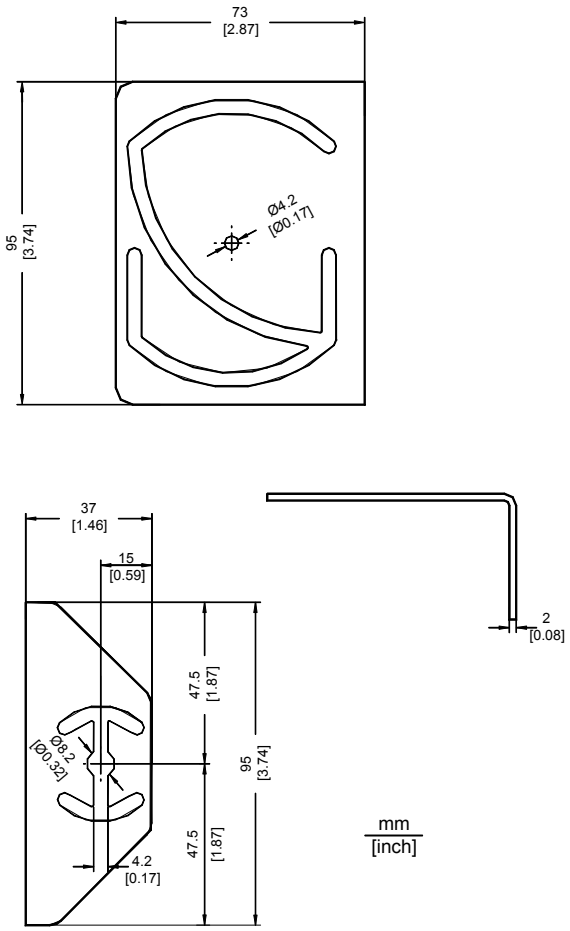


Figure 36 - Mounting Bracket Overall Dimensions

3.2.1 Mounting Matrix-2000™

Using the Matrix-2000™ mounting bracket you can obtain vertical shift and rotation of the reader as shown in the diagram below:

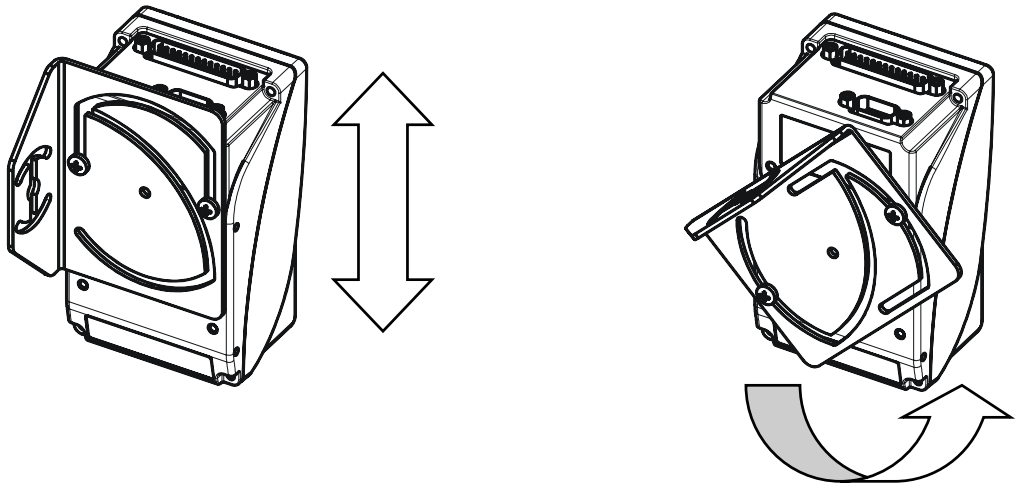


Figure 37 - Positioning with Mounting Brackets

3.3 POSITIONING

Matrix-2000™ is able to decode code labels at a variety of angles, however significant angular distortion may degrade reading performance.

When mounting Matrix-2000™, take into consideration these **ideal** label position angles: **Pitch or Skew 10° to 20° and Tilt 0°**.

Note: Since Matrix-2000™ is omni-directional on the code plane, the Pitch and Skew angles have the same significance with respect to the code plane. However in some advanced code reading applications performance can be improved by modifying the Skew angle.

Follow the suggestions below for the best orientation:

The **Pitch and Skew** angles are represented by the values **P** and **S** in Figure 38 and in Figure 39. Position the reader in order to avoid the direct reflection of the light emitted by the Matrix-2000™ reader; it is advised to **assure at least 10°** for one of these angles. In some cases, such as low contrast or low illumination, it can be useful to use a **Pitch or Skew** angle = 0°.

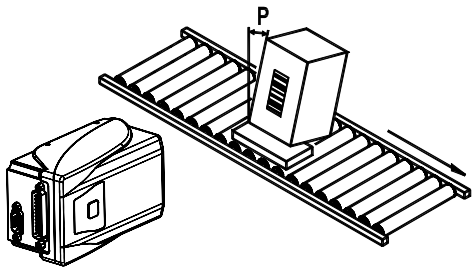


Figure 38 - Pitch angle

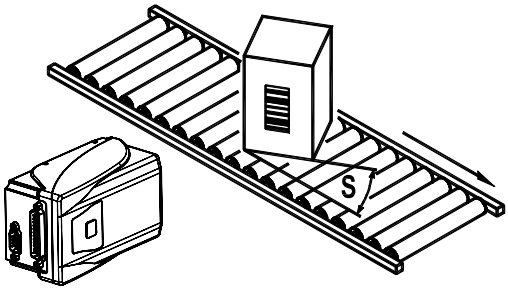


Figure 39 - Skew angle

The **Tilt** angle is represented by the value **T** in Figure 40. Matrix-2000™ can read labels with any tilt angle.

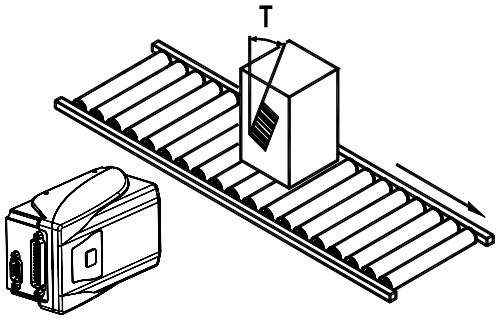


Figure 40 - Tilt angle

Position the reader so that the distance from the reading window to the code surface is that indicated in par. 7.1 for your model.

4 CBX ELECTRICAL CONNECTIONS

All Matrix-2000™ models can be connected to a CBX connection box through one of the available **CAB-Sxx** accessory cables. These accessory cables terminate in a 25-pin female D-sub connector on the Matrix-2000™ side and in a 25-pin male D-sub connector on the CBX side.

We recommend making system connections through one of the CBX connection boxes since they offer the advantages of easy connection, easy device replacement and filtered reference signals.

NOTE

If you require direct wiring to the reader the details of the connector pins and relative connections are indicated in Chaper 5.

The table below gives the pinout of the CBX100/500 terminal block connectors. Use this pinout when the Matrix-2000™ reader is connected by means of the CBX100/500:

CBX100/500 Terminal Block Connectors			
Input Power			
Vdc	Power Supply Input Voltage +		
GND	Power Supply Input Voltage -		
Earth	Protection Earth Ground		
Inputs			
+V	Power Source – External Trigger		
I1A	External Trigger A (polarity insensitive)		
I1B	External Trigger B (polarity insensitive)		
-V	Power Reference – External Trigger		
+V	Power Source – Inputs		
I2A	Input 2 A (polarity insensitive)		
I2B	Input 2 B (polarity insensitive)		
-V	Power Reference – Inputs		
Outputs			
+V	Power Source - Outputs		
-V	Power Reference - Outputs		
O1+	Output 1 +		
O1-	Output 1 -		
O2+	Output 2 +		
O2-	Output 2 -		
O3A	Output 3 + (CBX500 only - polarity sensitive)		
O3B	Output 3 - (CBX500 only - polarity sensitive)		
Auxiliary Interface			
TX	Auxiliary Interface TX		
RX	Auxiliary Interface RX		
SGND	Auxiliary Interface Reference		
Shield			
Shield	Network Cable Shield		
Main Interface			
	RS232	**RS485 Full-Duplex**	**RS485 Half-Duplex**
	TX	TX+	RTX+
	RX	*RX+	
	RTS	TX-	RTX-
	CTS	*RX-	
	SGND	SGND	SGND

***** Do not leave floating, see par. 4.2.2 for connection details.

NOTE

To avoid electromagnetic interference when the reader is connected to a CBX connection box, verify the jumper positions in the CBX as indicated in its Installation Manual.

4.1 POWER SUPPLY

Power can be supplied to the reader through the CBX100/500 spring clamp terminal pins as shown in Figure 41:

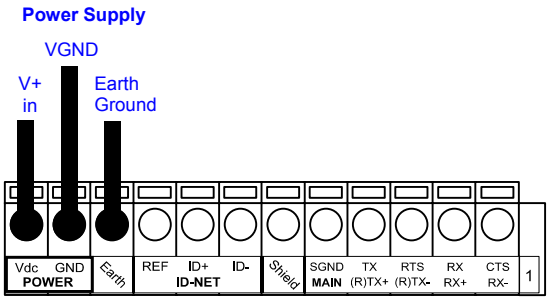


Figure 41 - Power Supply Connections

The power must be between 10 and 30 Vdc only.

It is recommended to connect the device CHASSIS to earth ground (Earth) by setting the appropriate jumper in the CBX connection box. See the CBX Installation Manual for details.

4.2 MAIN SERIAL INTERFACE

The signals relative to the following serial interface types are available on the CBX spring clamp terminal blocks.

The main serial interface type and its parameters (baud rate, data bits, etc.) can be defined by the user via VisiSet™ software. The RS485 half duplex is automatically set whenever MUX32 communication protocol is enabled. For more details refer to the "Communication" folder in the VisiSet™ Help On Line.

Details regarding the connections and use of the interfaces are given in the next paragraphs.

4.2.1 RS232 Interface

The RS232 interface can be used for Point-to-Point, Pass Through or Master/Slave connections. When it is connected to the host computer it allows both transmission of code data and reader configuration by VisiSet™.

The following pins are used for RS232 interface connection:

CBX100/500	Function
TX	Transmit Data
RX	Receive Data
RTS	Request To Send
CTS	Clear To Send
SGND	Signal Ground

It is always advisable to use shielded cables. The overall maximum cable length must be less than 15 m (49.2 ft).

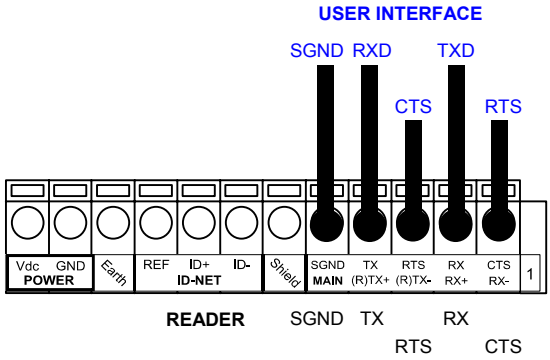


Figure 42 – RS232 Main Interface Connections Using Hardware Handshaking

The RTS and CTS signals control data transmission and synchronize the connected devices.

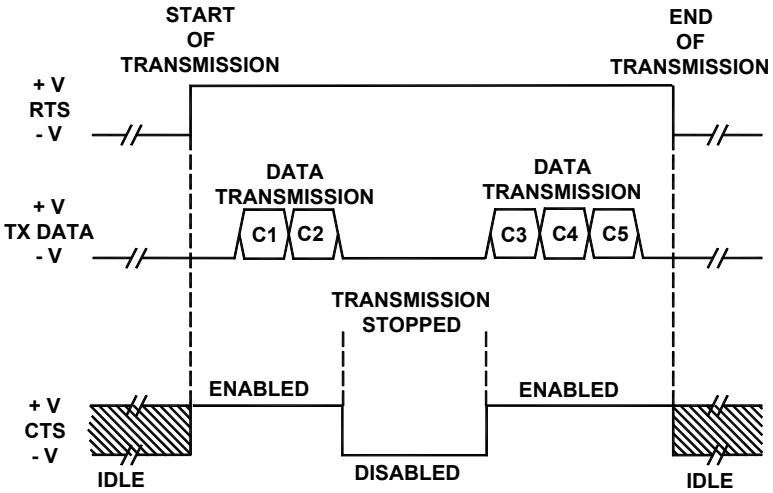


Figure 43 - RS232 Control Signals

If the RTS/CTS handshaking protocol is enabled, the Matrix-2000™ activates the RTS output to indicate a message is to be transmitted. The receiving unit activates the CTS input to enable the transmission.

4.2.2 RS485 Full-Duplex Interface

The RS485 full-duplex (5 wires + shield) interface is used for non-polled communication protocols in point-to-point connections over longer distances (max 1200 m / 3940 ft) than those acceptable for RS232 communications or in electrically noisy environments.

The CBX pinout follows:

CBX100/500	Function
TX+	RS485 Transmit Data +
RX+	RS485 Receive Data +
TX-	RS485 Transmit Data -
RX-	RS485 Receive Data -
SGND	Signal Ground

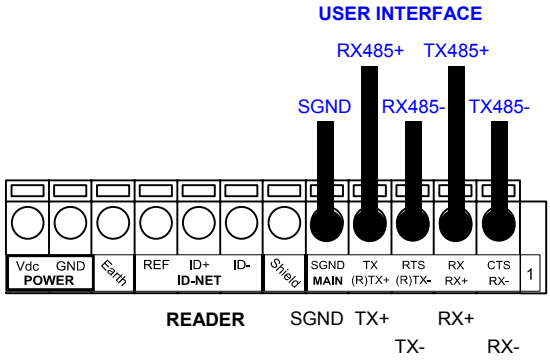


Figure 44 - RS485 Full-duplex Connections

NOTE

For applications that do not use RX485 signals, do not leave these lines floating but connect them to SGND as shown below.

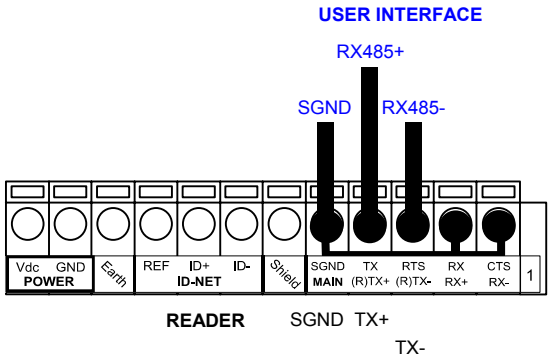


Figure 45 - RS485 Full-duplex Connections using Only TX Signals

4.2.3 RS485 Half-Duplex Interface

The RS485 half-duplex (3 wires + shield) interface is used for polled communication protocols.

It can be used for Multidrop connections with a Datalogic Multiplexer, (see par. 6.4) exploiting a proprietary protocol based on polled mode called MUX32 protocol, where a master device polls slave devices to collect data.

CBX100/500	Function
RTX+	RS485 Receive/Transmit Data +
RTX-	RS485 Receive/Transmit Data -
SGND	Signal Ground

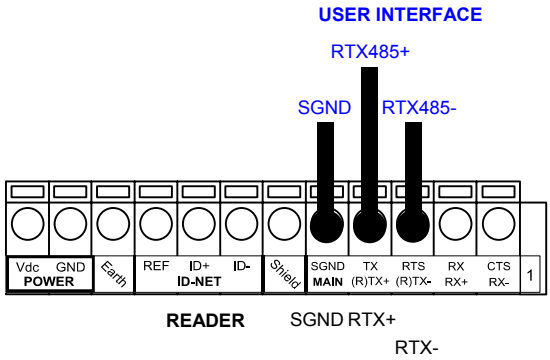


Figure 46 - RS485 Half-duplex Connections

This interface is forced by software when the protocol selected is MUX32 protocol.

In a Multiplexer layout, the Multidrop address must also be set via serial channel by the VisiSet™ utility or by the Host Programming Mode.

Figure 47 shows a multidrop configuration with Matrix-2000™ readers connected to a Multiplexer.

CAUTION

This is an example of multidrop wiring. Consult the multiplexer manual for complete wiring instructions.

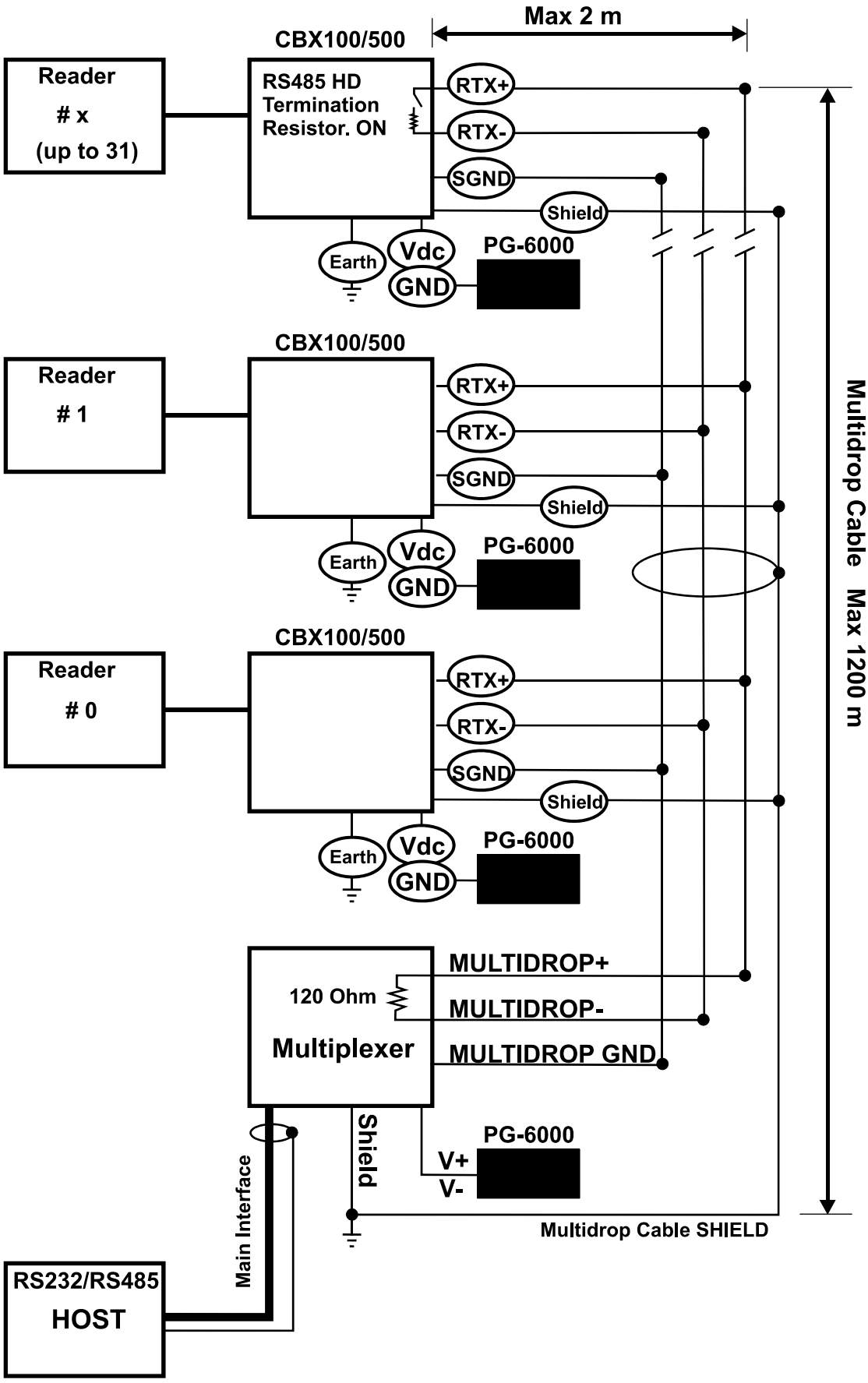


Figure 47 – Matrix-2000™ Multidrop Connection to a Multiplexer

4.3 AUXILIARY RS232 INTERFACE

The RS232 auxiliary interface is available for Point-to-Point, Pass Through or Master/Slave connections. When it is connected to the host computer it allows both transmission of code data and reader configuration by VisiSet™.

The parameters relative to the aux interface (baud rate, data bits, etc.) as well as particular communication modes such as LOCAL ECHO can be defined through the Communication folder of the VisiSet™ utility program.

The 9-pin female Auxiliary Interface connector inside the CBX is the preferred connector for device configuration or communication monitoring.

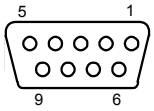


Figure 48 - 9-pin female connector

If permanent system wiring is required, the following pins are used to connect the RS232 auxiliary interface:

CBX100/500	Function
RX	Auxiliary Interface Receive Data
TX	Auxiliary Interface Transmit Data
SGND	Auxiliary Interface Reference

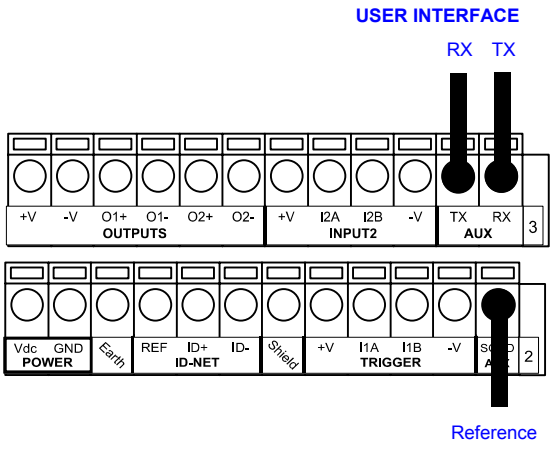


Figure 49 - RS232 Auxiliary Interface Connections

NOTE

Do not connect the Aux Interface to the CBX spring clamp connectors and the 9-pin connector simultaneously.

4.4 INPUTS

There are two optocoupled polarity insensitive inputs available on the reader: Input 1 (External Trigger) and Input 2, a generic input:

The External Trigger can be used in One Shot Mode or in Phase Mode. Its main functions are:

- acquisition trigger in One Shot Mode
- reading phase-ON/reading phase-OFF command in Phase Mode

The main functions of the general purpose Input 2 are:

- second external trigger in Phase Mode
- match code storage command when the Match Code option is enabled

The electrical features of both inputs are:

V_{AB} = 30 Vdc max.

I_{IN} = 10 mA (reader) + 12 mA (CBX) max.

The active state of these inputs are selected in software.

An anti-disturbance filter (debounce filter) is implemented in software on both inputs and is software programmable to filter in the range from 500 microseconds to 10 milliseconds.

Refer to the Digital I/O folder in the VisiSet™ Help On Line for further details.

These inputs are optocoupled and can be driven by both NPN and PNP type commands.

NOTE

Polarity insensitive inputs assure full functionality even if pins A and B are exchanged.

The connections are indicated in the following diagrams:

CBX100/500	Function
+V	Power Source - External Trigger
I1A	External Trigger A (polarity insensitive)
I1B	External Trigger B (polarity insensitive)
-V	Power Reference - External Trigger

When current flows through the I1A-B input (External Trigger), the yellow TRIG LED (Figure A, 6) is on.

EXTERNAL TRIGGER INPUT CONNECTIONS USING MATRIX-2000™ POWER

CAUTION

Power is available directly to the Input Device, independently from the Power Supply Switch inside the CBX.

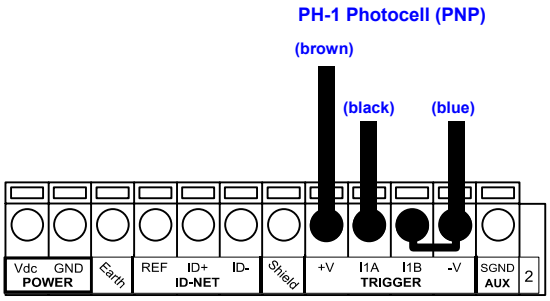


Figure 50 – PH-1 External Trigger Using MATRIX-2000™ Power

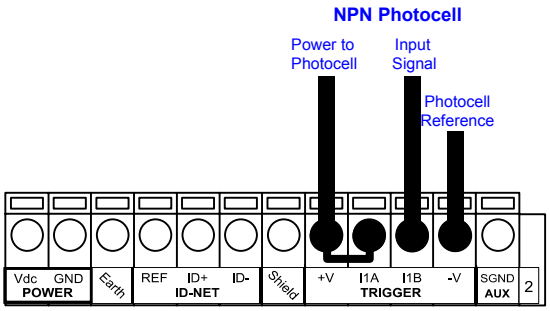


Figure 51 - NPN External Trigger Using MATRIX-2000™ Power

EXTERNAL TRIGGER INPUT CONNECTIONS USING EXTERNAL POWER

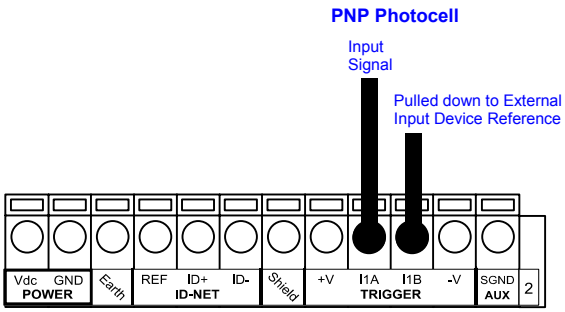


Figure 52 - PNP External Trigger Using External Power

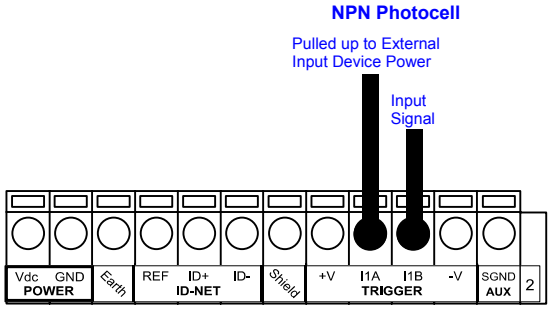


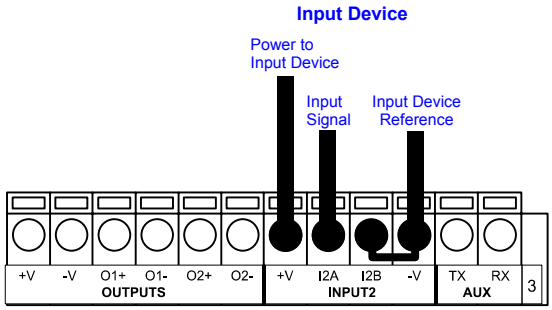
Figure 53 - NPN External Trigger Using External Power

CBX100/500	Function
+V	Power Source - Inputs
I2A	Input 2 A (polarity insensitive)
I2B	Input 2 B (polarity insensitive)
-V	Power Reference - Inputs

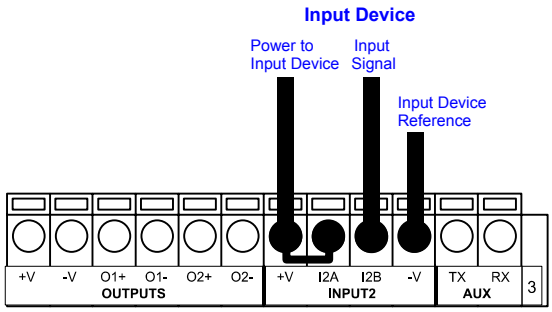
INPUT 2 CONNECTIONS USING MATRIX-2000™ POWER

CAUTION

Power is available directly to the Input Device, independently from the Power Supply Switch inside the CBX.



PNP Input 2 Using MATRIX-2000™ Power



NPN Input 2 Using MATRIX-2000™ Power

INPUT 2 CONNECTIONS USING EXTERNAL POWER

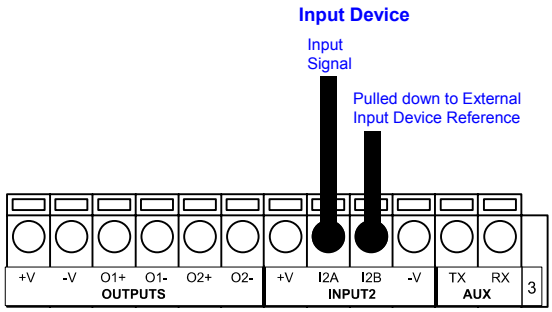


Figure 54 - PNP Input 2 Using External Power

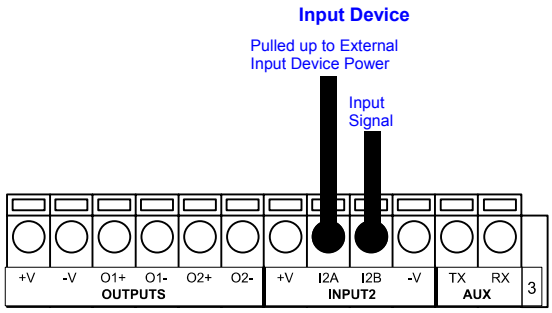


Figure 55 - NPN Input 2 Using External Power

4.5 OUTPUTS

Thee optocoupled general purpose outputs are available. The meaning of the three outputs can be defined by the user. They are typically used either to signal the data collection result or to control an external lighting system.

CBX100/500	Function
+V	Power Source - Outputs
O1+	Output 1 +
O1-	Output 1 -
O2+	Output 2 +
O2-	Output 2 -
O3+	Output 3 +
O3-	Output 3 -
-V	Power Reference Outputs

The electrical features of the three outputs are the following:

V_{CE} = 30 Vdc max.

I_{CE} = 40 mA continuous max.; 130 mA pulsed max.

$V_{CE\ saturation}$ = 1 Vdc max. @ 10 mA

P_D = 80 mW Max. @ 45 °C ambient temp.

By default, Output 1 is associated with the Partial Read and No Read events, which activates when the code(s) signaled by the external trigger are not decoded, and Output 2 is associated with the Complete Read event, which activates when all the selected codes are correctly decoded. Output 3, by default, is not associated with any event.

The output signals are fully programmable being determined by the configured Activation/Deactivation events, Deactivation Timeout or a combination of the two. Refer to the Digital I/O folder in the VisiSet™ Help On Line for further details.

OUTPUT CONNECTIONS USING MATRIX-2000™ POWER

CAUTION

Power is available directly to the Output Device, independently from the Power Supply Switch inside the CBX.

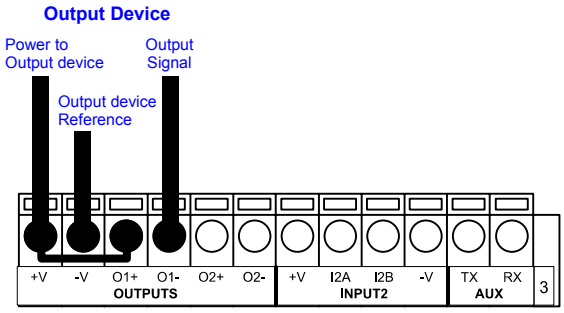


Figure 56 - Open Emitter Output Using MATRIX-2000™ Power

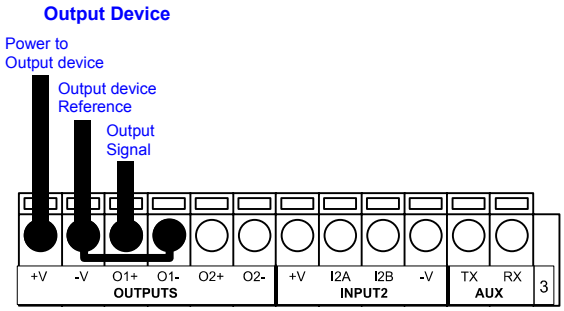


Figure 57 - Open Collector Output Using MATRIX-2000™ Power

OUTPUT CONNECTIONS USING EXTERNAL POWER

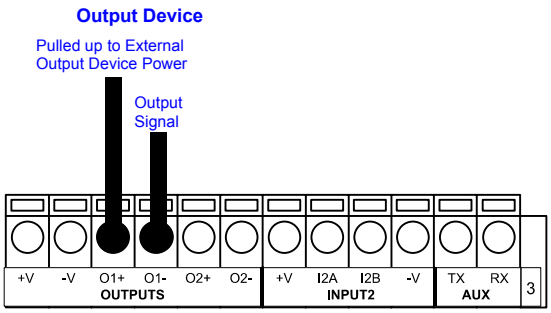


Figure 58 - Output Open Emitter Using External Power

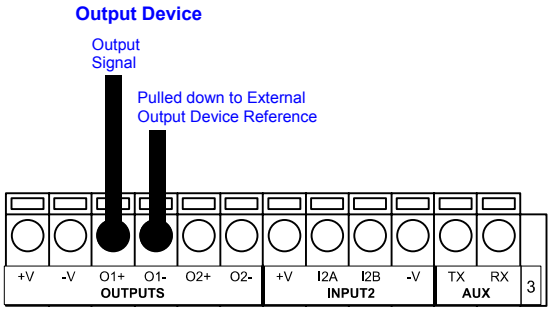


Figure 59 - Output Open Collector Using External Power

4.6 EXTERNAL LIGHTING SYSTEMS

If an External Illuminator is used, it can be powered from the CBX connection box. It must be connected to the **Vdc** and **GND** terminal clamps.

CAUTION

Power is available directly to the Illuminator, independently from the Power Supply Switch inside the CBX.

In the case of the LT-100, LT-200 or LT-300 illuminators, one of the available digital outputs must be connected as the control signal. In VisiSet™, configure the Output Line Function parameter to "External Lighting System" and the Matrix Output *x* External Lighting System Mode parameter to "Triggered".

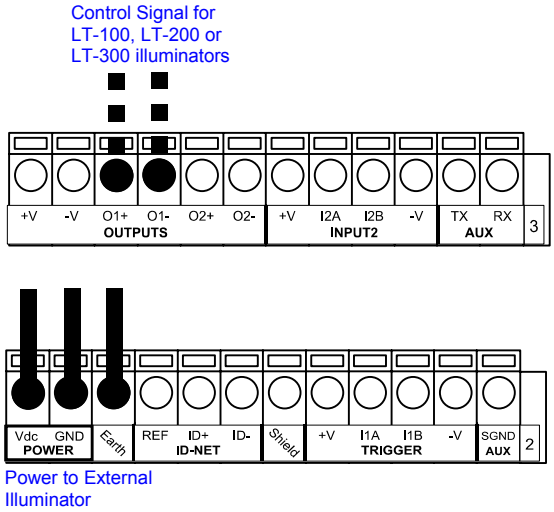


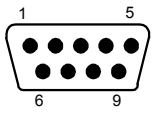
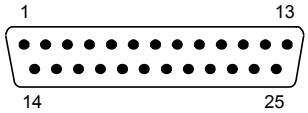
Figure 60 – External Lighting System Connections

Below is a table summarizing the various External Illuminator wiring and power requirements:

Illuminator	Wire Color	CBX/Matrix Signal	Meaning
LT-100 LT-200	Red	Vdc	10 to 30 Vdc
	Black	GND	Ground
	Blue	O1- or O2-	Control Signal -
	White	O1+ or O2+	Control Signal +
LT-300	Brown	Vdc	10 to 30 Vdc
	Black	GND	Ground
	Yellow/Green	Earth	Shield/Earth Ground
	Blue	O1- or O2-	Control Signal -
	White	O1+ or O2+	Control Signal +
LT-210, LT-314, LT-316, LT-410 LT-510, LT-511	White	Vdc	24 Vdc
	Black	GND	Ground
	Shield	Earth	Shield/Earth Ground

4.7 USER INTERFACE - HOST

The following table contains the pinout for standard RS232 PC Host interface. For other user interface types please refer to their own manual.

RS232 PC-side connections			
 9-pin male connector		 25-pin male connector	
Pin	**Name**	**Pin**	**Name**
2	RX	3	RX
3	TX	2	TX
5	GND	7	GND
7	RTS	4	RTS
8	CTS	5	CTS

5 MATRIX-2000™ CONNECTOR ELECTRICAL CONNECTIONS

5.1 DB25-PIN CONNECTOR

The Matrix-2000™ reader is equipped with a 25-pin male D-Sub connector for connection to the power supply and input/output signals. The details of the connector pins are indicated in the following table:

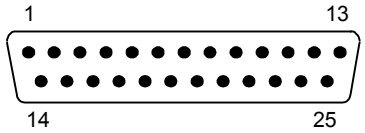


Figure 61 - 25-pin male D-Sub Connector

19-pin M16 male connector pinout				
Pin	**Name**	**Function**		
9, 13 23, 25 1	Vdc GND CHASSIS	Power supply input voltage + Power supply input voltage - Cable shield internally connected by capacitor to the chassis		
18 19 6 10	I1A I1B I2A I2B	External Trigger A (polarity insensitive) External Trigger B (polarity insensitive) Input 2 A (polarity insensitive) Input 2 B (polarity insensitive)		
8 22 11 12 16 17	O1+ O1- O2+ O2- O3+ O3-	Output 1 + Output 1 - Output 2 + Output 2 - Output 3 + Output 3 -		
20 21	RX TX	Auxiliary RS232 RX (referred to GND) Auxiliary RS232 TX (referred to GND)		
14, 15, 24	NC	Not connected		
Pin	**Name**	**RS232**	**RS485 Full-Duplex**	**RS485 Half-Duplex**
2 3 4 5 7	MAIN INTERFACE (SW SELECTABLE)	TX RX RTS CTS GND_ISO	TX+ *RX+ TX- *RX- GND_ISO	RTX+ RTX- GND_ISO

* Do not leave floating, see par. 5.5.2 for connection details.

In order to meet EMC requirements:

- connect the reader chassis to the plant earth ground by means of a flat copper braid shorter than 100 mm;
- connect the main interface cable shield to pin 1 of the 25-pin connector;
- use two clip-on ferrite sleeves (type Stewart 28A2029-0A0 or equivalent) on the main interface cable near the reader 25-pin connector;
- connect the Ethernet interface cable shield to reader chassis (for Matrix-21XX only)

5.2 DB9-PIN CONNECTOR (RS232 AUXILIARY PORT)

There is also a separate 9-pin female D-sub connector for the Auxiliary port connection with the following pinout:

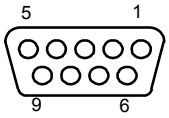


Figure 62 - 9-pin female D-Sub Connector

9-pin female D-sub connector pinout		
Pin	**Name**	**Function**
2	TX	Transmitted data of auxiliary RS232
3	RX	Received data of auxiliary RS232
5	GND	Reference GND of auxiliary RS232
1,4,6,7,8,9	N.C.	Not connected

CAUTION

If Matrix-2000™ is connected to a CBX with a BM100 Backup Module, then the Matrix-2000™ 9-pin Auxiliary port connector cannot be used for communication (i.e. configuration through VisiSet™). In this case use the Auxiliary port 9-pin connector inside the CBX.

5.3 RJ45 8-PIN CONNECTOR (ETHERNET)

In Matrix-21XX models a RJ45 Modular Jack is provided for Ethernet connection. This interface and the connector pinout (see the following table) are IEEE 802.3 10 BaseT and IEEE 802.3u 100 BaseTx compliant. See par. 5.7 for connection details.

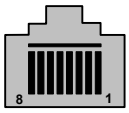


Figure 63 - RJ45 Modular Jack

RJ45 modular jack pinout		
Pin	**Name**	**Function**
1	TX +	Transmitted data (+)
2	TX -	Transmitted data (-)
3	RX +	Received data (+)
6	RX -	Received data (-)
4,5,7,8	N.C.	Not connected

5.4 POWER SUPPLY

Power is supplied to the reader through the pins provided on the 25-pin connector (see Figure 64):

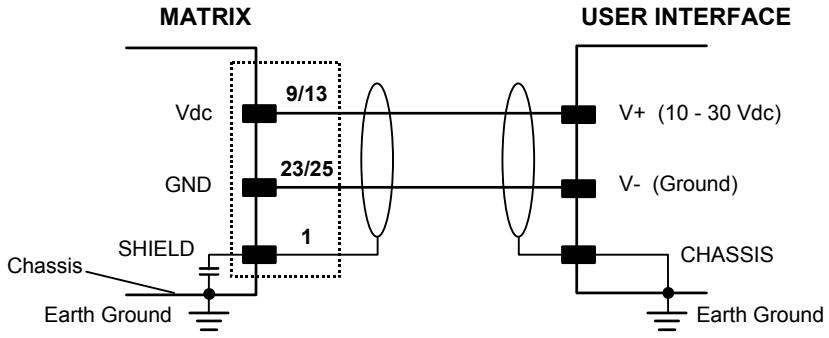


Figure 64 - Power Supply Connection

The allowed supply voltage range is 10 to 30 Vdc.

5.5 MAIN SERIAL INTERFACE

The signals relative to the following serial interface types are available on the 25-pin connector.

The main serial interface type and its parameters (baud rate, data bits, etc.) can be defined by the user via VisiSet™ software. The RS485 half duplex is automatically set whenever MUX32 communication protocol is enabled. For more details refer to the "Communication" folder in the VisiSet™ Help On Line.

Details regarding the connections and use of the interfaces are given in the next paragraphs.

5.5.1 RS232 Interface

The opto-isolated RS232 interface can be used for Point-to-Point, Pass Through or Master/Slave connections. When it is connected to the host computer it allows both transmission of code data and reader configuration by VisiSet™.

The following pins of the 25-pin connector are used for RS232 interface connection:

Pin	Name	Function
2	TX	Transmit Data
3	RX	Receive Data
4	RTS	Request To Send
5	CTS	Clear To Send
7	GND_ISO	Main opto-isolated reference ground

It is always advisable to use shielded cables. The overall maximum cable length must be less than 15 m (49.2 ft).

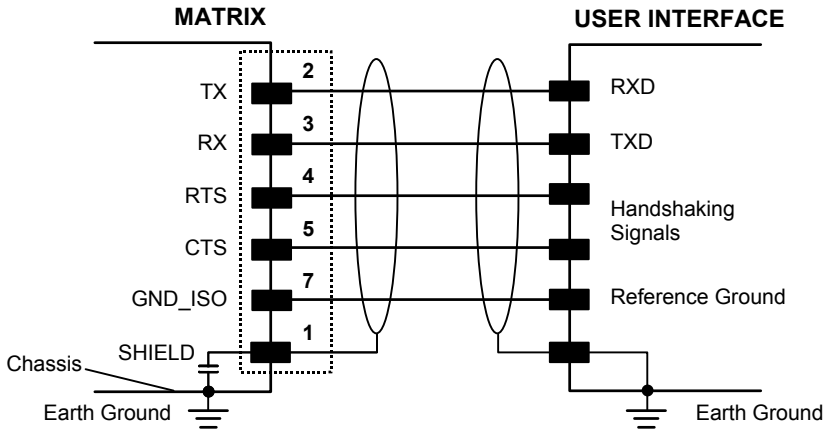


Figure 65 - RS232 Main Interface Connections

The RTS and CTS signals control data transmission and synchronize the connected devices.

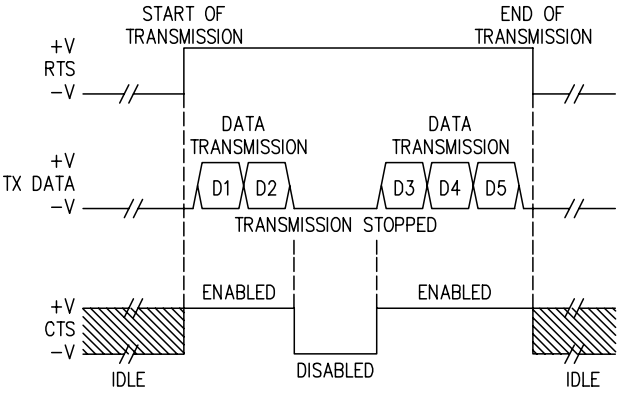


Figure 66 - RS232 Control Signals

If the RTS/CTS handshaking protocol is enabled, Matrix-2000™ activates the RTS output to indicate a message is to be transmitted. The receiving unit activates the CTS input to enable the transmission.

5.5.2 RS485 Full-Duplex Interface

The RS485 full-duplex (5 wires + shield) interface is used for non-polled communication protocols in point-to-point connections over longer distances (max 1200 m / 3940 ft) than those acceptable for RS232 communications or in electrically noisy environments.

The following pins of the 25-pin connector are used for RS485 full-duplex communication:

Pin	Name	Function
2	TX+	RS485 Transmit Data (+)
4	TX-	RS485 Transmit Data (-)
3	RX+	RS485 Receive Data (+)
5	RX-	RS485 Receive Data (-)
7	GND_ISO	Main opto-isolated reference ground

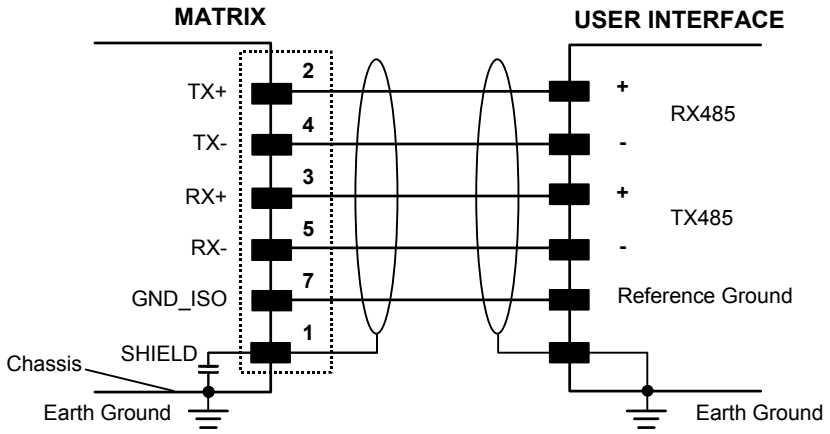


Figure 67 - RS485 Full-duplex Connections

NOTE

For applications that do not use RX485 signals, do not leave these lines floating but connect them to GND_ISO as shown below.

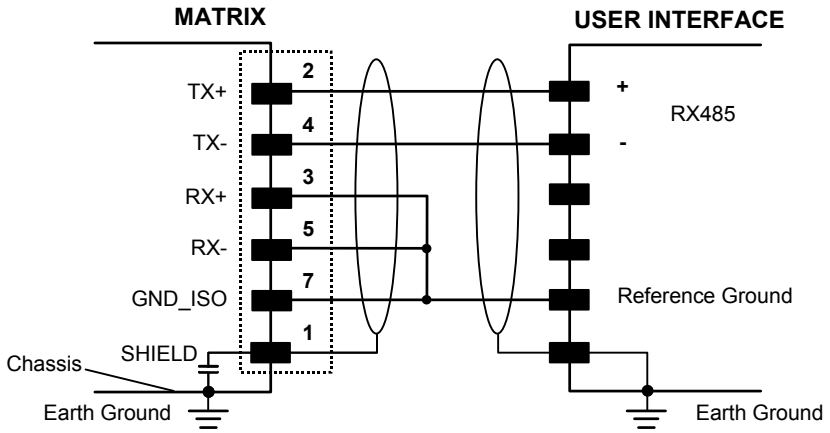


Figure 68 - RS485 Full-duplex Connections using Only TX Signals

5.5.3 RS485 Half-Duplex Interface

The opto-isolated RS485 half-duplex (3 wires + shield) interface is available for polled communication protocols.

It can be used for multidrop connections with a Datalogic Multiplexer, (see Figure 70 and par. 6.4) exploiting a proprietary protocol based on polled mode called MUX32 protocol, where a master device polls slave devices to collect data.

The following pins of the 25-pin connector are used for RS485 half-duplex communication:

Pin	Name	Function
2	RTX+	RS485 Receive/Transmit Data (+)
4	RTX-	RS485 Receive/Transmit Data (-)
7	GND_ISO	Main opto-isolated reference ground

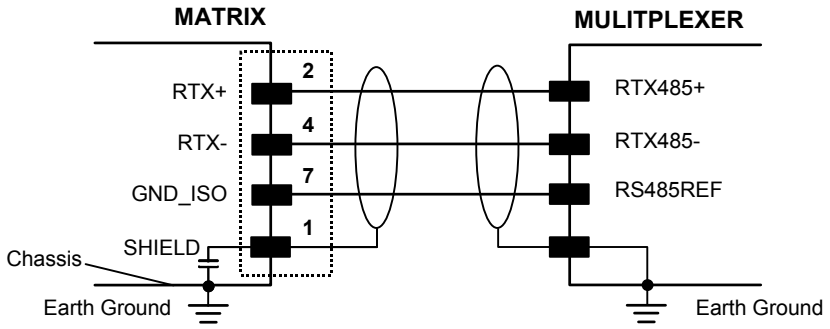


Figure 69 - RS485 Half-duplex Connections

This interface is forced by software when the protocol selected is MUX32 protocol.

In a Multiplexer layout, the Multidrop address must also be set via serial channel by the VisiSet™ utility or by the Host Programming Mode.

The figure below shows a multidrop configuration with Matrix-2000™ readers connected to a Multiplexer.

CAUTION

This is an example of multidrop wiring. Consult the multiplexer manual for complete wiring instructions.

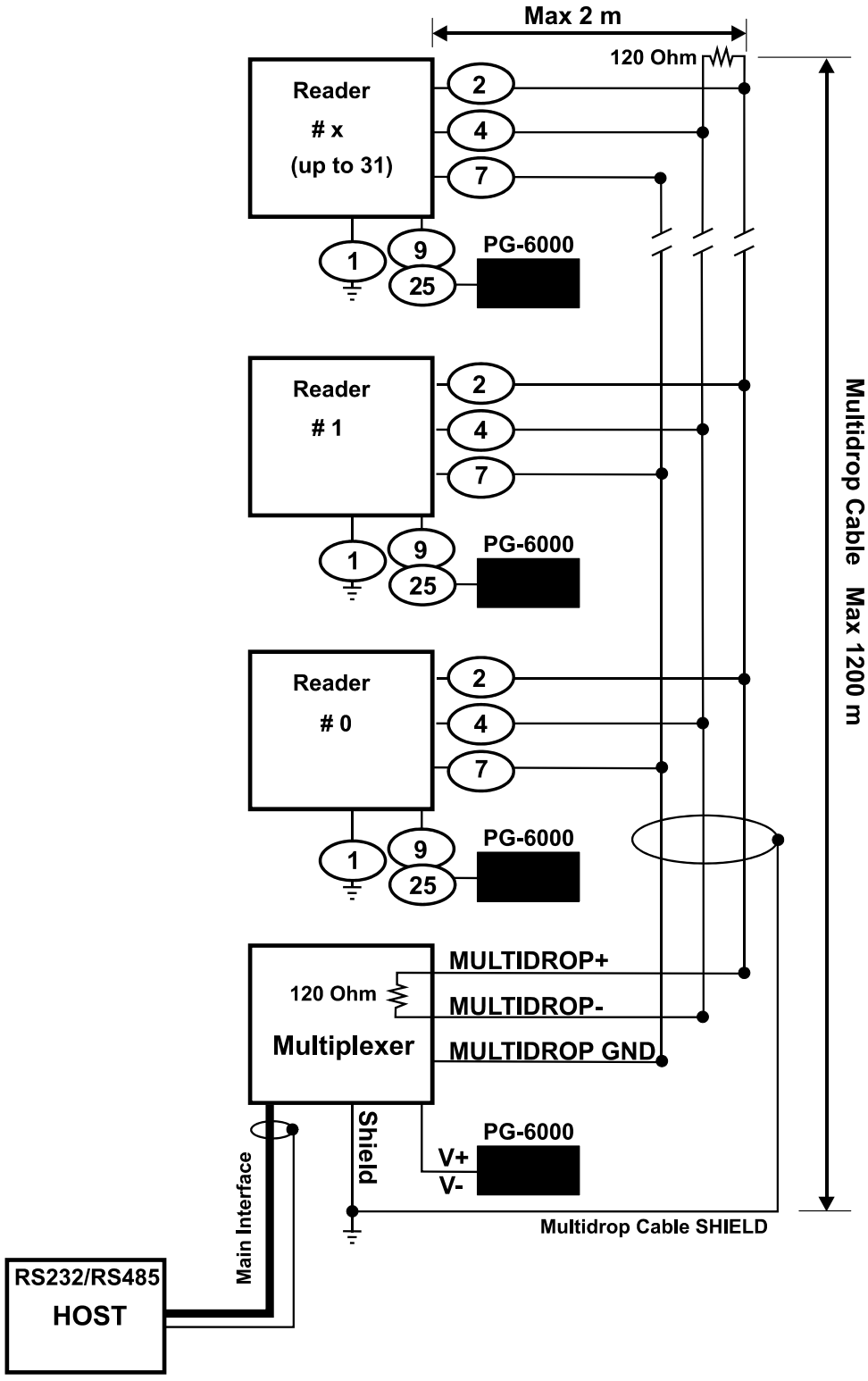


Figure 70 – Matrix-2000™ Multidrop Connection to a Mutiplexer

5.6 AUXILIARY RS232 INTERFACE

The RS232 auxiliary interface is available for Point-to-Point, Pass Through or Master/Slave connections. When it is connected to the host computer it allows both transmission of code data and reader configuration by VisiSet™.

The parameters relative to the aux interface (baud rate, data bits, etc.) as well as particular communication modes such as LOCAL ECHO can be defined through the Communication folder of the VisiSet™ utility program.

The auxiliary interface is available on both D-sub connectors with the following pinouts:

9-Pin	25-Pin	Name	Function
2	21	TX	Transmitted data
3	20	RX	Received data
5	23	GND	Ground

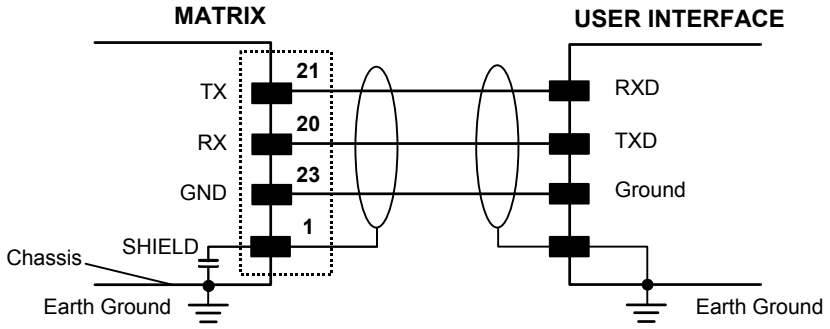


Figure 71 - RS232 Auxiliary Interface Connections Using 25-pin Connector

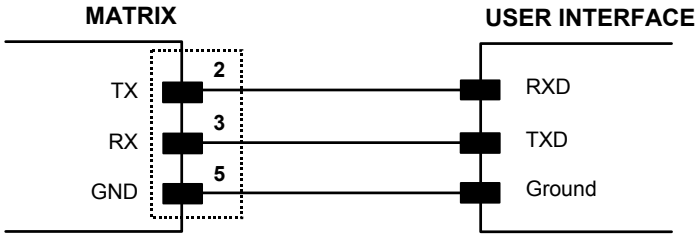


Figure 72 - RS232 Auxiliary Interface Connections Using 9-pin Connector

When the auxiliary interface is permanently connected as part of the system cabling, it is recommended to use the 25-pin connector and connect the cable shield as shown in Figure 71.

CAUTION

Avoid simultaneous connection to 25-pin and 9-pin signals of the auxiliary RS232 interface.

CAUTION

If Matrix-2000™ is connected to a CBX with a BM100 Backup Module, then the Matrix-2000™ 9-pin Auxiliary port connector cannot be used for communication (i.e. configuration through VisiSet™). In this case use the Auxiliary port 9-pin connector inside the CBX.

5.7 ETHERNET INTERFACE (MATRIX-21XX MODELS ONLY)

The Ethernet Interface can be used for TCP/IP communication with a remote or local host computer by connecting the reader to either a LAN or directly to a host PC.

The following is an example of a connection to a LAN using a straight through cable:

RJ45 Modular Jack Pinout		
Pin	**Name**	**Function**
1	TX+	Transmitted data (positive pin)
2	RX+	Received data (positive pin)
3	TX-	Transmitted data (negative pin)
6	RX-	Received data (negative pin)
4, 5, 7, 8	NC	Not connected

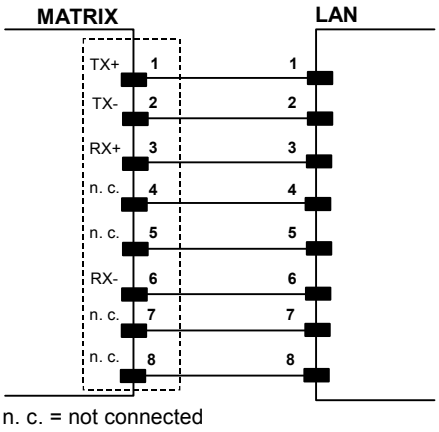


Figure 73 - Straight-Through Cable

The following is an example of direct connection to a PC using a crossover cable:

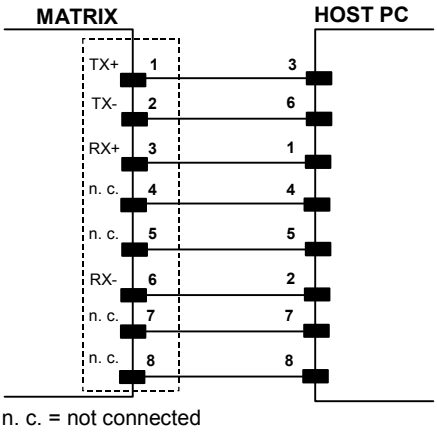


Figure 74 - Crossover Cable

On the Matrix-2000™ Ethernet interface the following communication channels are available:

- Data Socket
- Image Socket
- Image FTP Client
- HTTP Server
- Email Client
- Ethernet IP

For further details refer to the Ethernet Folder in the VisiSet™ Help On Line and to the "Matrix Ethernet Service Guide.pdf" document provided as supplementary documentation.

5.8 INPUTS

There are two optocoupled polarity insensitive inputs available on the 25-pin connector of the reader: Input 1 (External Trigger) and Input 2, a generic input:

The External Trigger can be used in One Shot Mode or in Phase Mode. Its main functions are:

- acquisition trigger in One Shot Mode
- reading phase-ON/reading phase-OFF command in Phase Mode

The main functions of the general purpose Input 2 are:

- second external trigger in Phase Mode
- match code storage command when the Match Code option is enabled

The electrical features of both inputs are:

INPUT	$\lvert V_{AB} \rvert$ Min.	$\lvert V_{AB} \rvert$ Max.	I_{IN} Max.
Open	0 V	2 V	0 mA
Closed	4.5 V	30 V	10 mA

The active state of these inputs are selected in software.

An anti-disturbance filter (debounce filter) is implemented in software on both inputs and is software programmable to filter in the range from 500 microseconds to 10 milliseconds.

Refer to the Digital I/O folder in the VisiSet™ Help On Line for further details.

These inputs are optocoupled and can be driven by both NPN and PNP type commands.

NOTE

Polarity insensitive inputs assure full functionality even if pins A and B are exchanged.

The connections are indicated in the following diagrams:

Pin	Name	Function
9	Vdc	Power Supply input voltage +
18	I1A	External Trigger A (polarity insensitive)
19	I1B	External Trigger B (polarity insensitive)
25	GND	Power Supply input voltage -

When current flows through the I1A-B input (External Trigger), the yellow TRIG LED (Figure A, 6) is on.

EXTERNAL TRIGGER INPUT PNP PH-1

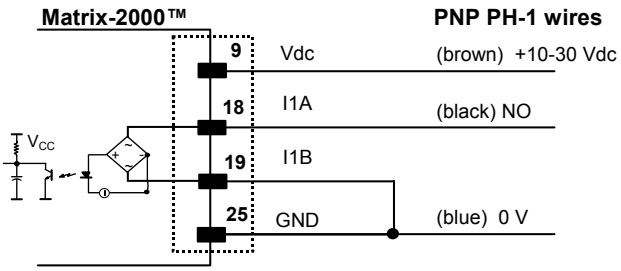


Figure 75 - External Trigger Using PNP PH-1 Photocell

EXTERNAL TRIGGER INPUT CONNECTIONS USING MATRIX-2000™ POWER

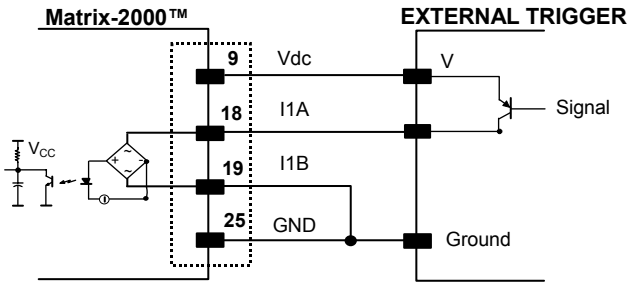


Figure 76 – External Trigger PNP Using Matrix-2000™ Power

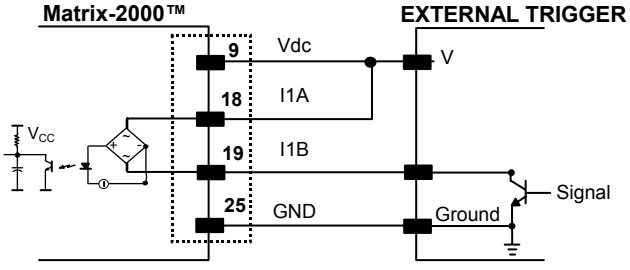


Figure 77 - External Trigger NPN Using Matrix-2000™ Power

EXTERNAL TRIGGER INPUT CONNECTIONS USING EXTERNAL POWER

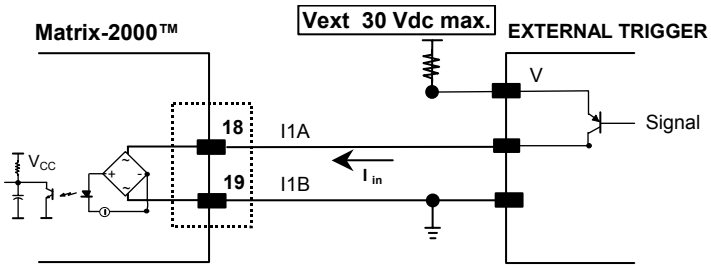


Figure 78 - External Trigger PNP Using External Power

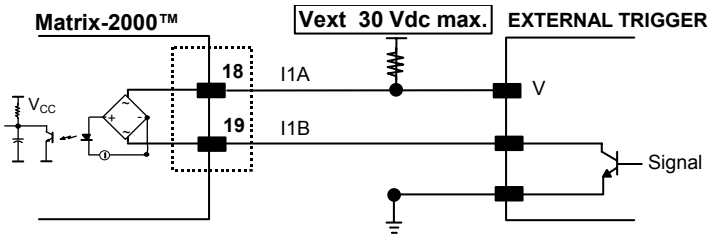


Figure 79 - External Trigger NPN Using External Power

Pin	Name	Function
9	Vdc	Power Supply input voltage +
6	I2A	Input 2 A (polarity insensitive)
10	I2B	Input 2 B (polarity insensitive)
25	GND	Power Supply input voltage -

INPUT 2 CONNECTIONS USING MATRIX-2000™ POWER

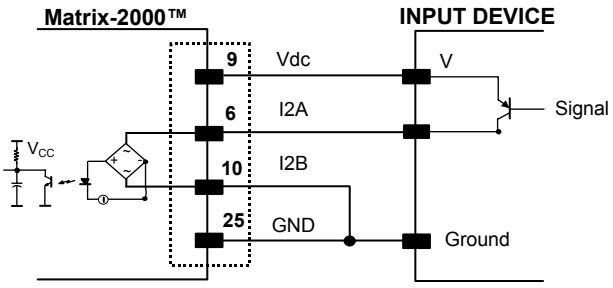


Figure 80 - Input PNP Using Matrix-2000™ Power

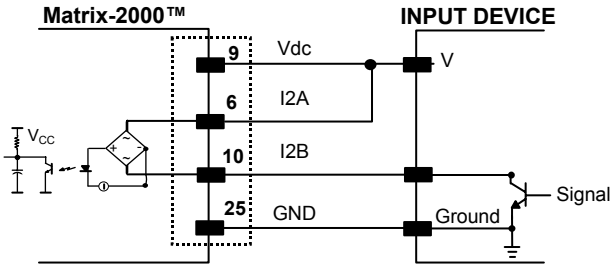


Figure 81 - Input NPN Using Matrix-2000™ Power

INPUT 2 CONNECTIONS USING EXTERNAL POWER

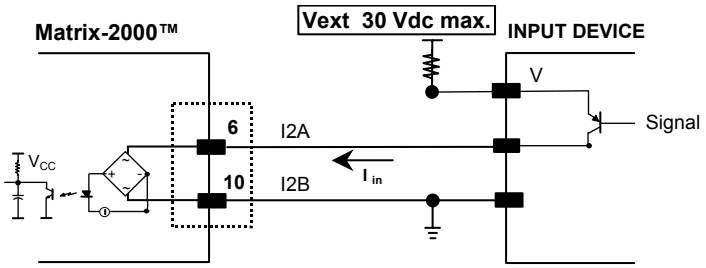


Figure 82 - Input PNP Using External Power

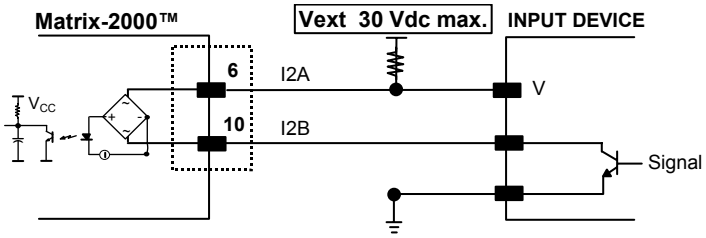


Figure 83 - Input NPN Using External Power

5.9 OUTPUTS

Three opto-coupled general purpose outputs are available on the 25-pin connector. The meaning of the three outputs can be defined by the user. They are typically used either to signal the data collection result or to control an external lighting system.

The pinout is the following:

Pin	Name	Function
8	O1+	Configurable digital output 1 - positive pin
22	O1-	Configurable digital output 1 - negative pin
11	O2+	Configurable digital output 2 - positive pin
12	O2-	Configurable digital output 2 - negative pin
16	O3+	Configurable digital output 3 - positive pin
17	O3-	Configurable digital output 3 - negative pin

The electrical features of the three outputs are the following:

OUTPUT	I_{Load}	V_{Out}
Open	0 mA	30 Vdc Max
Closed	10 mA	1.8 Vdc Max

$P_D = V_{Out} \times I_{oLoad}$ = 170 mW Max.

By default, Output 1 is associated with the Partial Read and No Read events, which activates when the code(s) signaled by the external trigger are not decoded, and Output 2 is associated with the Complete Read event, which activates when all the selected codes are correctly decoded. Output 3, by default, is not associated with any event.

The output signals are fully programmable being determined by the configured Activation/Deactivation events, Deactivation Timeout or a combination of the two. Refer to the Digital I/O folder in the VisiSet™ Help On Line for further details.

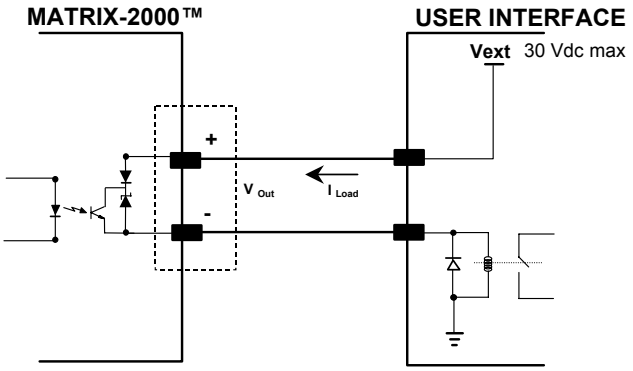


Figure 84 - Open Emitter Output Connection

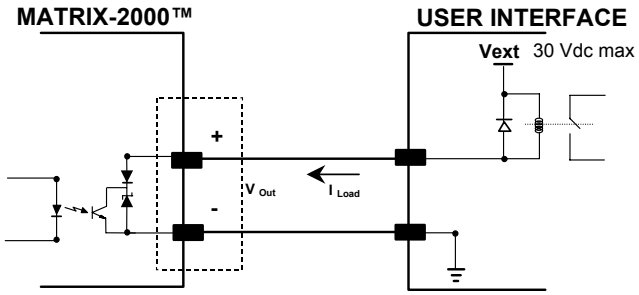
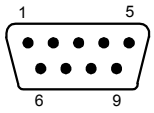
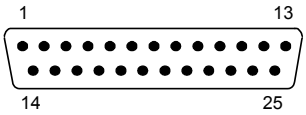


Figure 85 - Open Collector Output Connection

5.10 USER INTERFACE

RS232 PC-side connections			
 9-pin male connector		 25-pin male connector	
Pin	**Name**	**Pin**	**Name**
2	RX	3	RX
3	TX	2	TX
5	GND	7	GND
7	RTS	4	RTS
8	CTS	5	CTS

How To Build A Simple Interface Test Cable:

The following wiring diagram shows a simple test cable including power, external (push-button) trigger and PC RS232 COM port connections.

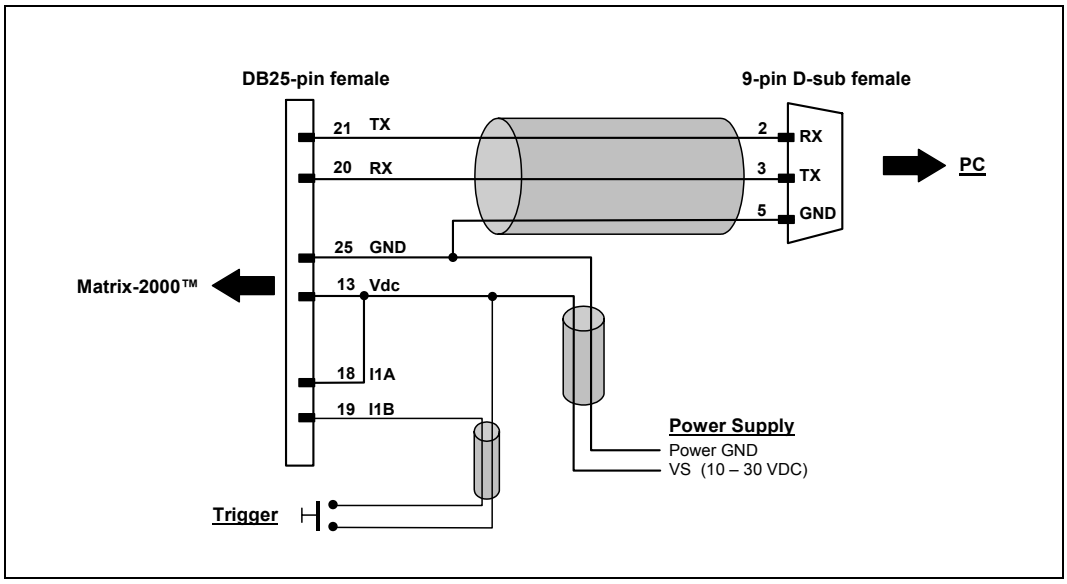


Figure 86- Test Cable for Matrix-2000™

6 TYPICAL LAYOUTS

The following typical layouts refer to system hardware configurations. However, they also require the correct setup of the software configuration parameters. Dotted lines in the figures refer to optional hardware configurations within the particular layout.

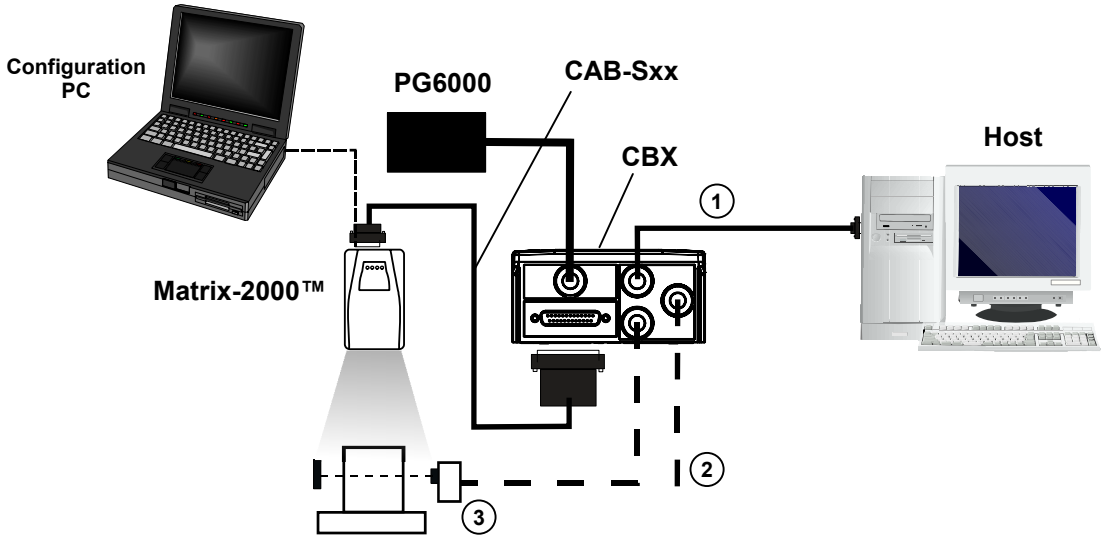
6.1 POINT-TO-POINT

In this layout the data is transmitted to the Host on the main serial interface.

The RS232 auxiliary interface can be used for reader configuration by connecting a laptop computer running VisiSet™. Host Mode programming can be accomplished either through the main interface or the Auxiliary interface.

In Local Echo communication mode, data is transmitted on the RS232 auxiliary interface independently from the main interface selection.

When One Shot or Phase Mode operating mode is used, the reader can be activated by an External Trigger (for example a pulse from a photoelectric sensor) when the object enters its reading zone.



① Main Serial Interface (RS232 or RS485 Full-Duplex)
② Auxiliary Serial Interface (Local Echo) (RS232)
③ External Trigger (for One Shot or Phase Mode)

Figure 87 – Serial Interface Point-to-Point Layout

NOTE

Only one device at a time can be connected to the Matrix-2000™ Auxiliary port, either through the reader 9-pin connector, CBX 9-pin connector or CBX spring clamp connectors.

6.2 PASS-THROUGH

Pass-through mode allows two or more devices to be connected to a single external serial interface.

Each reader transmits the messages received by the Auxiliary interface onto the Main interface. All messages will be passed through this chain to the host.

When One Shot or Phase Mode operating mode is used, the reader can be activated by an External Trigger (for example a pulse from a photoelectric sensor) when the object enters its reading zone.

Applications can be implemented to connect a device such as a hand-held reader to the Auxiliary port of the last reader in the chain for manual code reading capability.

The Main and Auxiliary ports are connected as shown in the figure below:

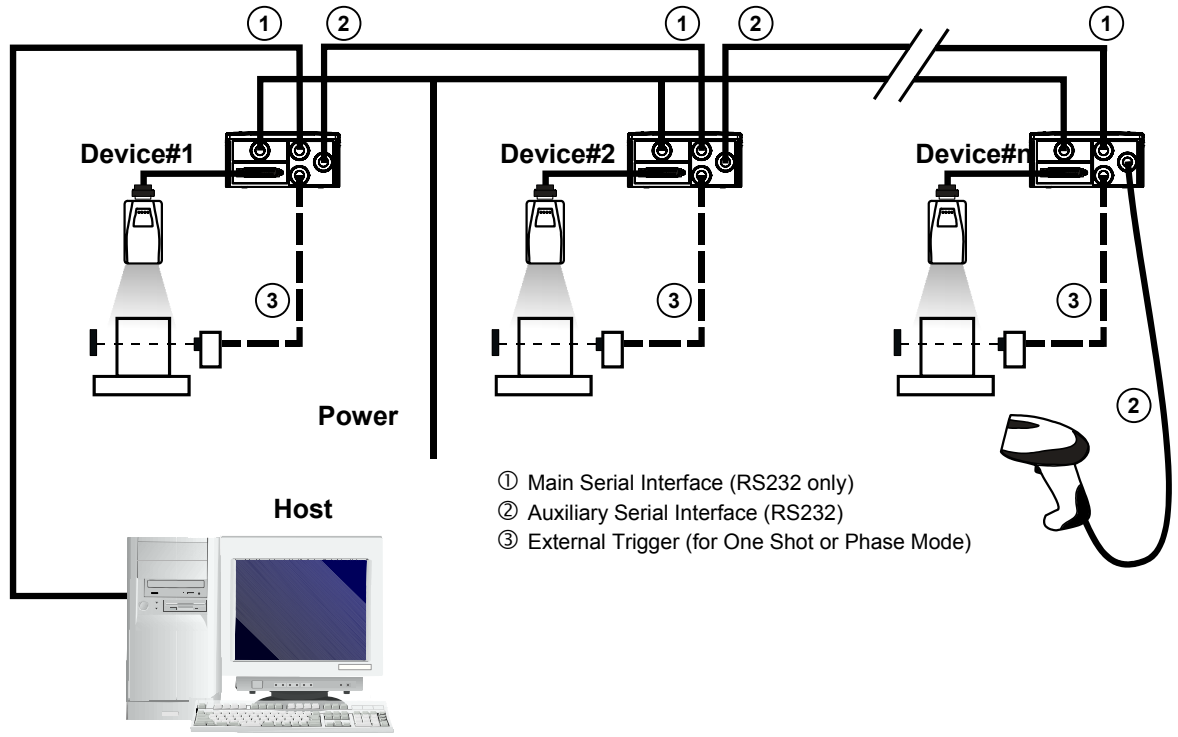


Figure 88 – Pass-Through Layout

6.3 RS232 MASTER/SLAVE

The RS232 master/slave connection is used to collect data from several readers to build either a multi-point or a multi-sided reading system; there can be one master and up to 9 slaves connected together.

The Slave readers use RS232 only on the main and auxiliary serial interfaces. Each slave reader transmits the messages received by the auxiliary interface onto the main interface. All messages will be passed through this chain to the Master.

The Master reader is connected to the Host on the RS232/RS485 main serial interface.

There is a single reading phase and a single message from the master reader to the Host computer.

In this layout the Master operating mode can be set only to Phase Mode.

The Phase ON/OFF signals must be brought only to the Master. It is not necessary to bring them to the Slave readers.

The main and auxiliary ports are connected as shown in the figure below.

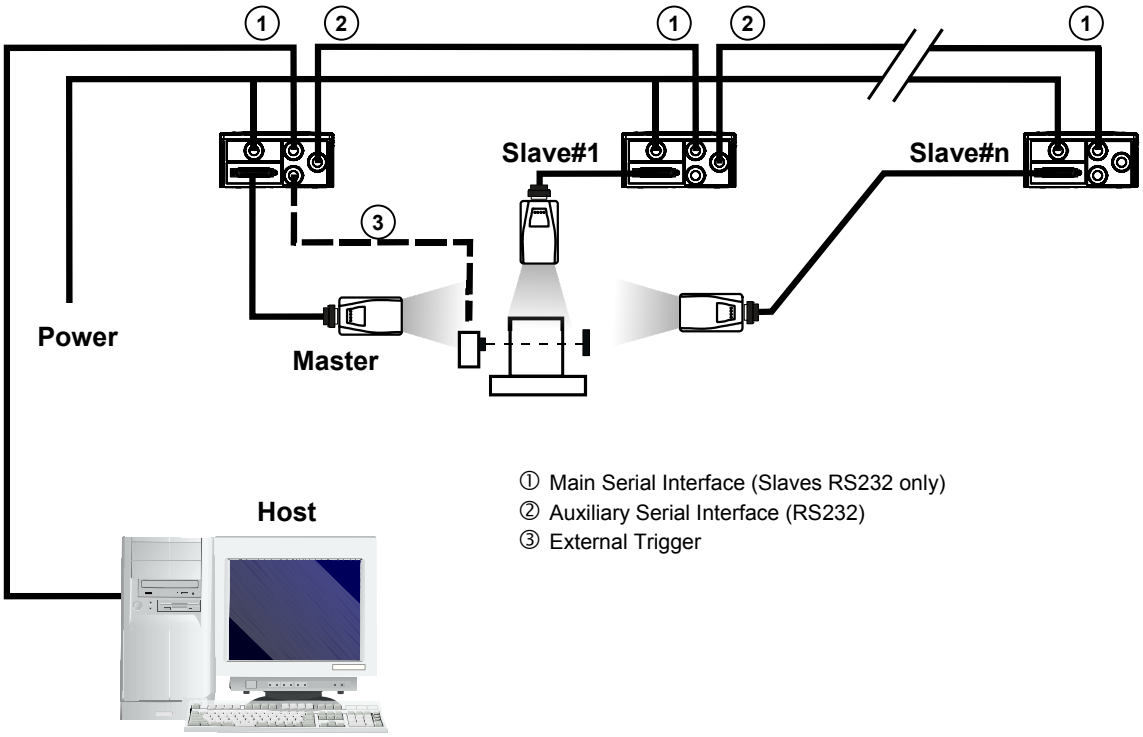


Figure 89 – RS232 Master/Slave Layout

6.4 MULTIPLEXER

Each reader is connected to a Multiplexer (for example MX4000) with the RS485 half-duplex main interface through a CBX connection box.

Before proceeding with the connection it is necessary to select the MUX32 communication protocol and the multidrop address for each reader.

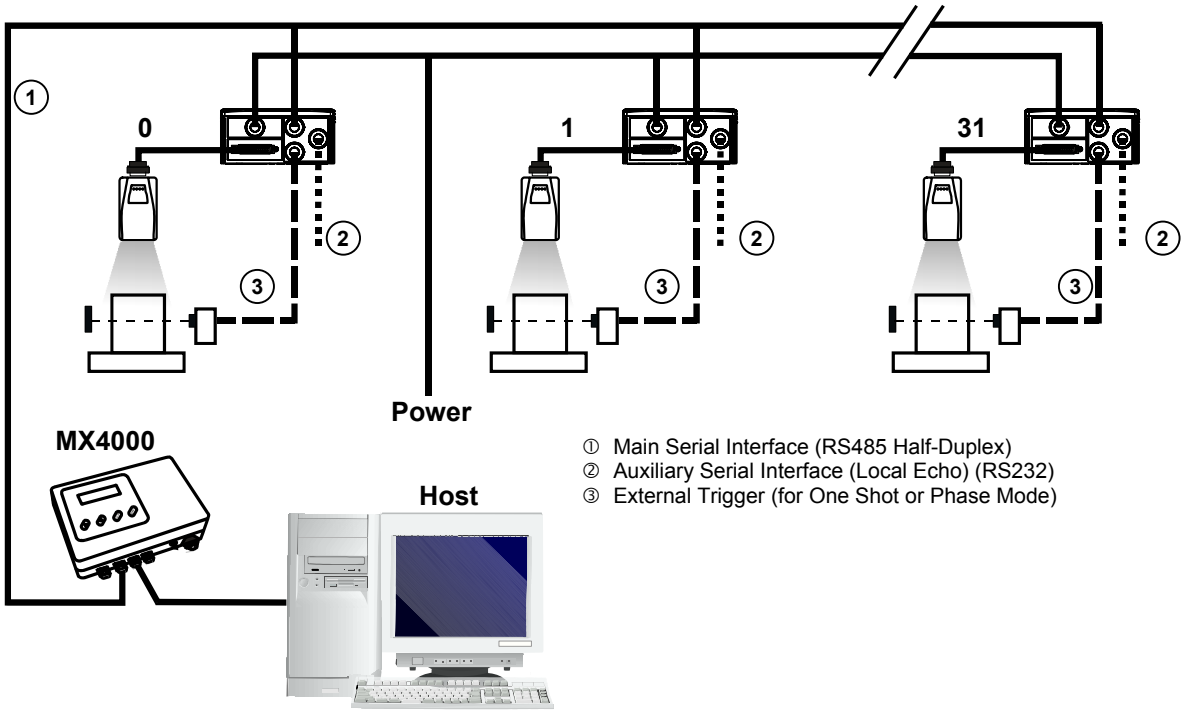


Figure 90 - Multiplexer Layout

The auxiliary serial interface of the slave readers can be used in Local Echo communication mode to control any single reader (visualize collected data) or to configure it using the VisiSet™ utility.

Each reader has its own reading phase independent from the others. When One Shot or Phase Mode operating mode is used, the reader can be activated by an External Trigger (for example a pulse from a photoelectric sensor) when the object enters its reading zone.

6.5 ETHERNET CONNECTION (MATRIX-21XX MODELS ONLY)

For Matrix-21XX models, the Ethernet connection is possible in two different layouts. In both layouts, before proceeding with the connection, it is necessary to configure the reader Ethernet parameters via VisiSet™. For further details, see the Ethernet Folder in the VisiSet™ Help On Line.

In a Point-to-Point layout the reader is connected to a local host by using a cable with a crossover adapter.

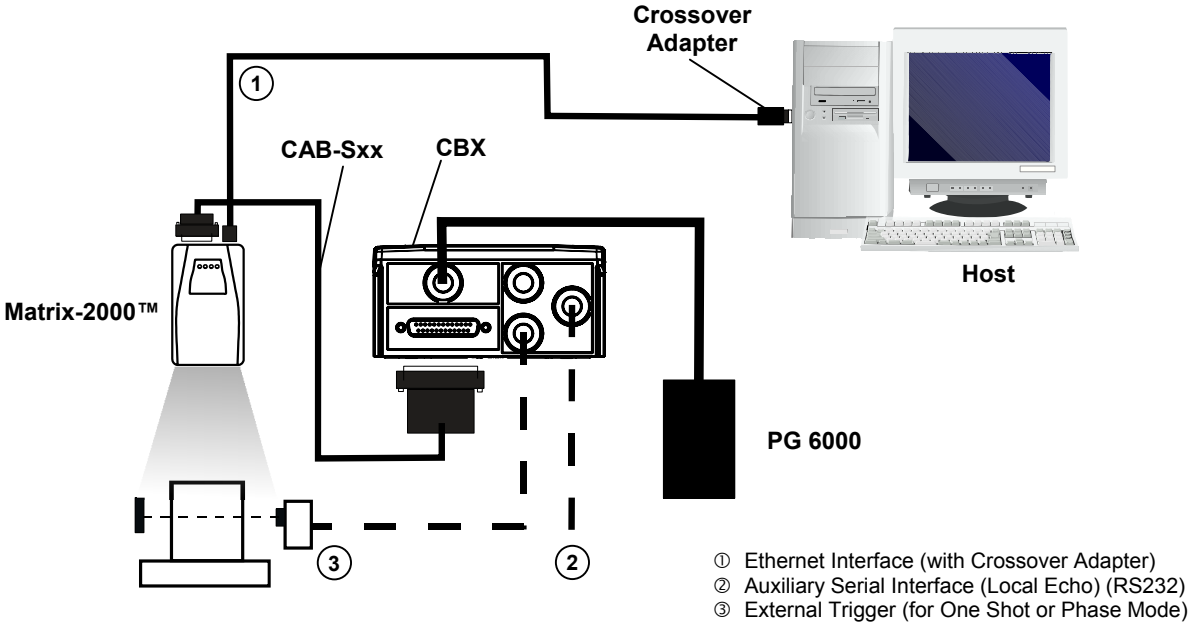
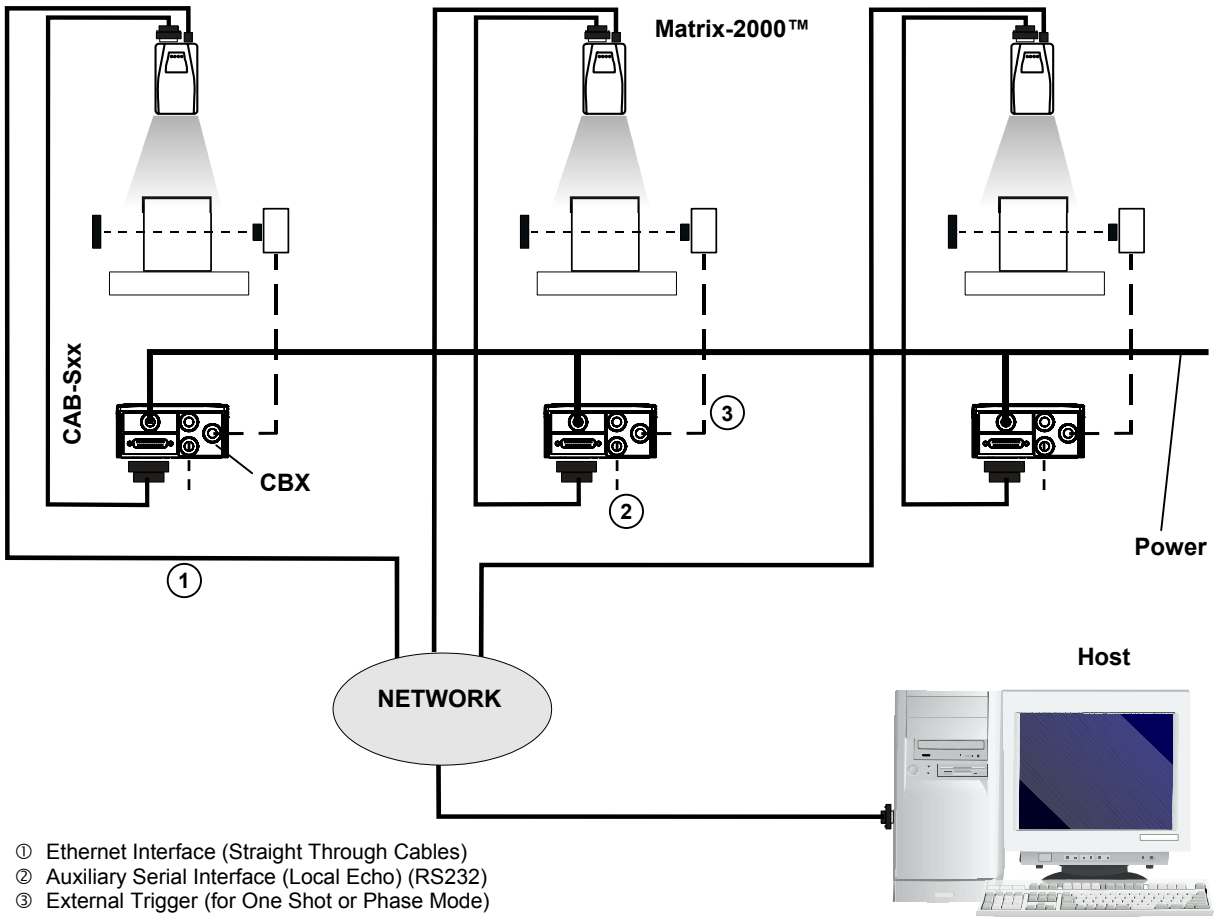


Figure 91 - Ethernet Point-to-Point Layout

When using a Local Area Network (LAN), one or more Matrix-21XXs can be connected to the network by using straight through cables:



① Ethernet Interface (Straight Through Cables)
② Auxiliary Serial Interface (Local Echo) (RS232)
③ External Trigger (for One Shot or Phase Mode)

Figure 92 - Ethernet Network Layout

7 READING FEATURES

7.1 READING DISTANCE AND FOV

The following figures represent the Reading Distance and Field of View (FOV) based on the Matrix-2000™ model. Position the reader so that the distance from the reading window to the code surface is that indicated in the figure below for your model.

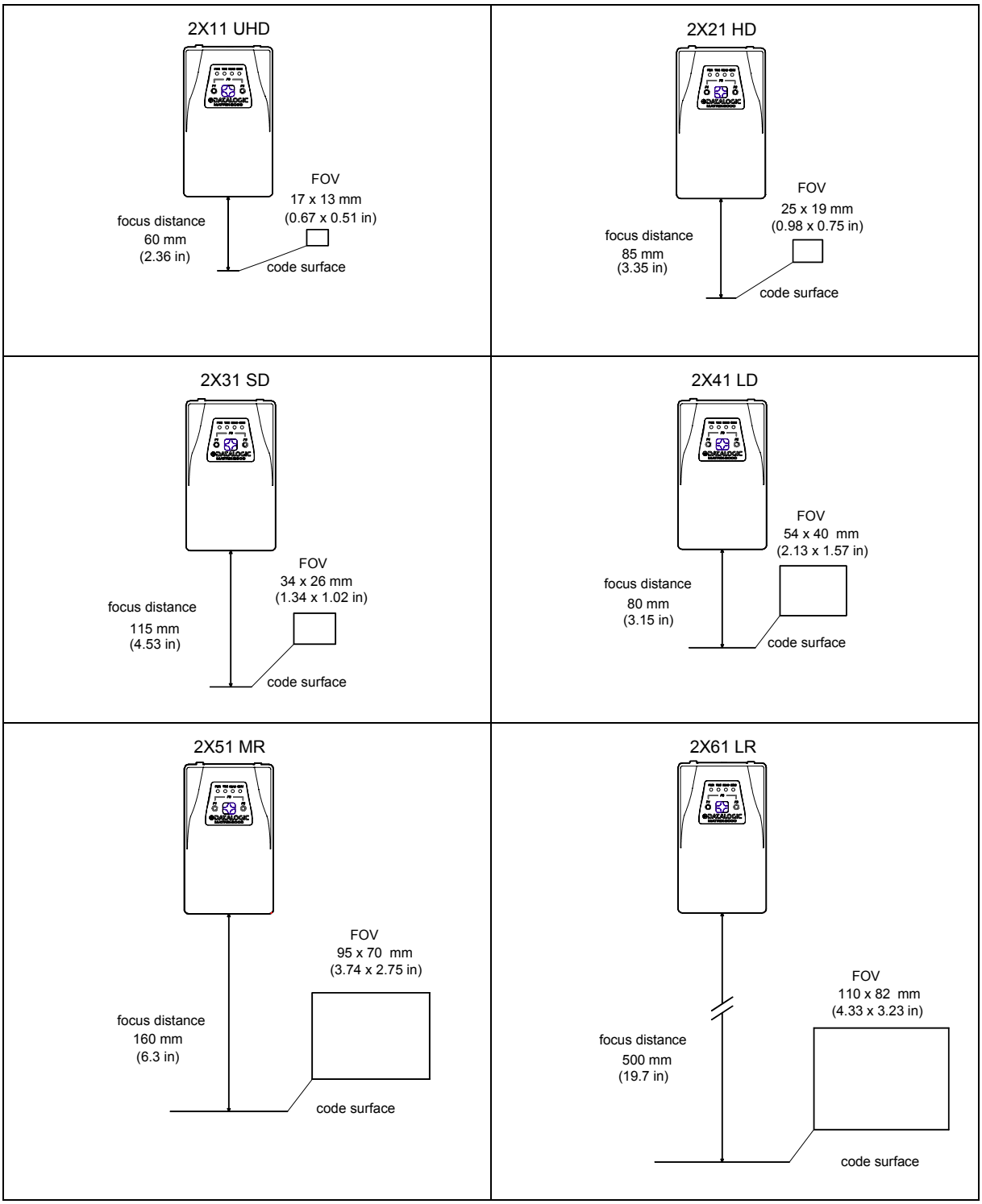


Figure 93 – VGA Model Positioning

Special models with different FOV and focus distance are available on request. Refer to your local Datalogic distributor.

All distances indicated from the reading window to the code surface are the same for 90° models.

READING FEATURES							
Frame Rate	Up to 60 frames/sec. with VGA images						
Readable Codes per Frame	Up to 100						
Pitch	10° - 35°						
Tilt	0° - 360°						
MODELS	**Focus Distance mm (in)**	**Field of View [1] mm (in)**	**ppi[2]**	**Typ. Linear and Stacked Code Resolution mm (mils)**	**Typ. 2D Code Resolution mm (mils)**	**Reading Distance [3] mm (in)**	
						min.	**max.**
2X11 UHD	60 (2.36)	17 × 13 (0.67 × 0.51)	955	0.10 (4)	0.13 (5)	51 (2.00)	74 (2.91)
2X21 HD	85 (3.35)	25 × 19 (0.98 × 0.75)	653	0.10 (4)	0.19 (7.5)	78 (3.07)	93 (3.66)
2X31 SD	115 (4.53)	34 × 26 (1.34 × 1.02)	478	0.15 (6)	0.25 (10)	100 (3.94)	130 (4.53)
2X41 LD	80 (3.15)	54 x 40 (2.13 × 1.57)	300	0.20 (8)	0.38 (15)	70 (2.76)	105 (4.13)
2X51 MR	160 (6.29)	95 × 70 (3.74×2.75)	170	0.30 (12)	0.60 (24)	120 (4.72)	220 (8.66)
2X61 LR	500 (19.69)	110 × 82 4.33×3.23)	148	0.30 (12)	0.60 (24)	430 (16.93)	570 (22.44)

[1] @ Focus Distance

[2] Pixels per inch @ Focus Distance

[3] Measurement Conditions:

- Test Chart: provided with the reader
- Still code at the center of the FOV
- Code Symbology: Data Matrix ECC 200
- Code Resolution: Max. 2D Code Resolution
- Tilt Angle: 45°
- Skew Angle: 15°
- Image Processing Mode: Advanced Code Setting

Depending on the code resolution, symbology and number of characters in the code, the Reading Area can be different from the FOV.

7.2 MAXIMUM LINE SPEED CALCULATION

The ***Exposure Time*** (or **Shutter**) parameter defines the time during which the image will be exposed to the reader sensor to be acquired. This parameter depends heavily on the environmental conditions (external lighting system, image contrast etc.).

In general, a longer time corresponds to a lighter image but is susceptible to blurring due to the code movement; a shorter exposure time corresponds to a darker image.

NOTE

*The following considerations must be applied only when the internal lighting system and **2D codes** are used. The Maximum line speed allowed for linear codes or postal code reading applications heavily depends on the direction of symbol movement. When the direction of movement is parallel to the elements of the code, the maximum speed is greater.*

Assuming:

- **X**: Code Resolution (mm)
- **Texp**: Exposure Time (s)
- **LS**: Line Speed (mm/s)

The essential condition to avoid blurring effects between two adjacent elements in a dynamic reading application is:

$$\mathbf{LS \times Texp \leq X}$$

The maximum (theoretical) line speed (LS) can be calculated as follows:

$$\mathbf{X / Texp\ (min) = LS\ (max)}$$

Texp (min) is the minimum ***Exposure Time*** value obtainable for the specific application. It can be evaluated in static reading conditions and may depend on code printing quality, reader position, etc.

Using the formulas previously explained it is possible to calculate the theoretical maximum line (target) speed expected for the application, based on the maximum code resolution and the minimum suitable ***Exposure Time*** value.

The minimum ***Exposure Time*** value depends on the Matrix reader model selected for the application (internal lighting system, optical lens, diaphragm aperture, reading distance) and on any external lighting system.

The ***Internal Lighting Mode*** parameter allows to set the operating mode of the internal lighting system. The possible values are:

- *Disabled*: the built-in LED array is turned off all the time. This option can be useful if using an external lighting system;
- *Always ON*: the built-in LED array is turned on all the time at the lowest power level. This option is useful if the LED-array blinking (Strobed operating mode) disturbs the operator.
- *Very High/High/Medium/Low-Power Strobed*: the built-in LED array is on only during the image exposure time. Four different lighting levels can be set.

NOTE

To avoid LED array overheating, for Power Strobed settings, the program automatically limits the range of allowed values for the ***Exposure Time*** *parameter. Therefore, after changes to Internal Lighting Mode, recheck* ***Exposure Time****.*

CAUTION:

The maximum target speed in the application is affected by these conditions:

- **Code/Background Contrast**: maximum speed decreases when decreasing image contrast (poor quality codes, reflective transparent coverings, different supports and printing techniques).
- **Code Resolution**: maximum speed increases when decreasing code resolution (there is a decrement of overlapping effects between two adjacent elements).
- **Tilt Angle**: maximum speed decreases when increasing Tilt angle (from 0 to 45 degrees).

8 SOFTWARE CONFIGURATION

Software configuration of your Matrix-2000™ for static reading or simple code reading applications can be accomplished by the Rapid Configuration procedure using the onboard keypad Autolearning Configuration (which requires no external configuration program) or by using the VisiSet™ Autolearning Wizard for easy setup. These procedures are described in chapter 1.

For all other applications use VisiSet™ through the reader serial ports (or Ethernet port for Matrix-21XX models only).

NOTE

Before using VisiSet™ via Ethernet, it is necessary to configure Matrix-2000™ Ethernet port parameters using VisiSet™ via Main or Auxiliary serial port (for further details refer to the VisiSet™ Help on line).

8.1 VISISET™ SYSTEM REQUIREMENTS

To install and run VisiSet™ you should have a Laptop or PC that meets or exceeds the following:

- Pentium processor
- Win 98/2000, NT 4.0, XP or Vista
- 32 MB Ram
- 5 MB free HD space
- one free RS232 serial port with 115 Kbaud
- SVGA board (800x600) or better using more than 256 colors

8.2 INSTALLING VISISET™

To install VisiSet™, proceed as follows:

1. Turn on the Laptop or PC that will be used for configuration (connected to the Matrix-2000™ communication ports).
2. After Windows finishes booting, insert the CD-ROM provided.
3. Launch VisiSet™ installation by clicking Install.
4. Follow the instructions in the installation procedure.

8.3 STARTUP

After completing the mechanical and electrical connections to Matrix-2000™, you can begin software configuration as follows:

1. Power on the Matrix-2000™ reader. Wait for the reader startup. The system bootstrap requires a few seconds to be completed. The reader automatically enters Run Mode.
2. Run the VisiSet™ program.
3. Press **Connect** on the VisiSet™ menu bar. The PC will automatically connect to the Matrix-2000™ reader.

   Upon connection, Matrix-2000™ exits Run Mode and displays the Main Menu on VisiSet™ with all the commands necessary to monitor your reader's performance. You can select these commands using the mouse or by pressing the key corresponding to the letter shown on the button. See Figure 94.

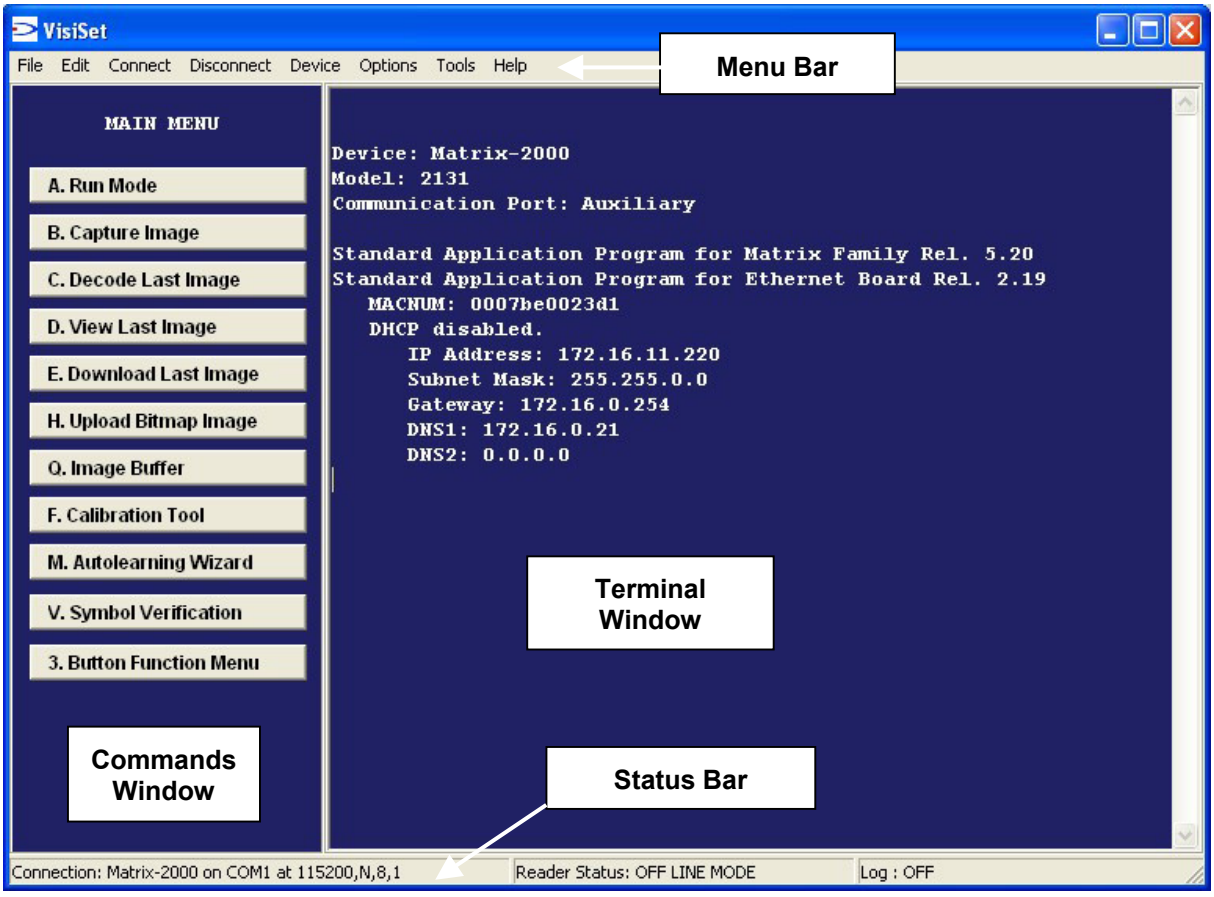


Figure 94 - Main Window

8.3.1 VisiSet™ Options

The **Options** item from the VisiSet™ menu (see Figure 94) presents a window allowing you to configure:

- the logging function (**Log**)
- VisiSet™ window properties (**Environment**)
- VisiSet™ communication channel (**Communication**)

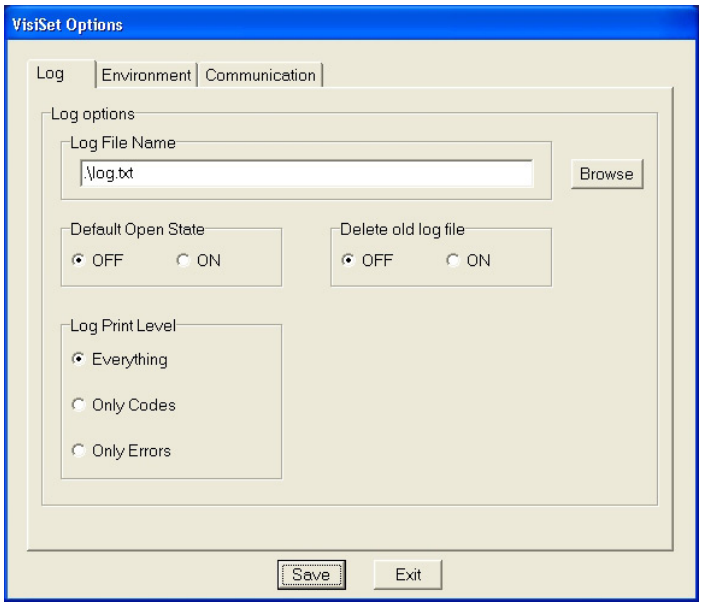


Figure 95 - Options - Log

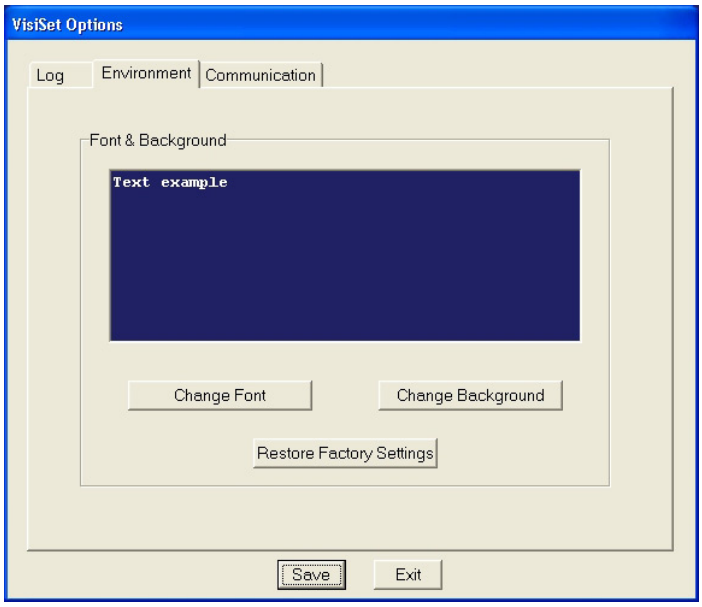


Figure 96 - Options - Environment

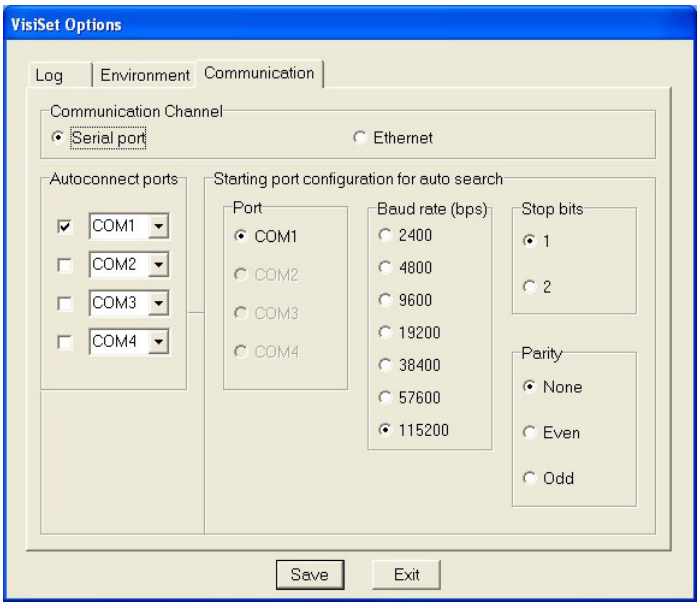


Figure 97 - Options – Communication: Serial Port

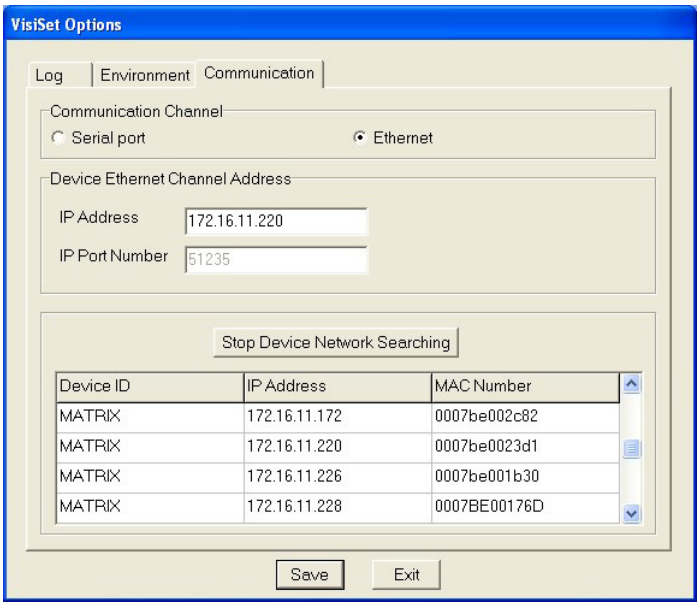


Figure 98 - Options – Communication: Ethernet

8.4 CONFIGURATION

Once connected to Matrix-2000™ as described in par. 8.3, you can modify the configuration parameters as follows:

1. Press the Calibration Tool button from the Main Menu. Matrix-2000™ will download its permanent memory configuration parameters with the default values (if it is the first time) to VisiSet™. The Calibration Tool window will be displayed together with the Parameter Setup window working in Interactive Mode (see par. 8.4.1 and par. 8.4.3).

2. Edit the Matrix-2000™ configuration parameters according to your application requirements.

3. Use the **Calibration Tool** to fine tune the reading performance. See par. 8.4.3.

4. Close the Calibration Tool window and disable the Interactive Mode by pressing the interactive button.

5. Save the new configuration to the reader permanent memory by pressing the Send button.

6. Close the Parameter Setup window and press **Disconnect** on the VisiSet™ menu bar (see Figure 94) or launch **Run** Mode from the VisiSet™ Main menu.

Disconnect exits closing communication between Matrix-2000™ and VisiSet™, and causes Matrix-2000™ to enter Run Mode. The disconnected reader serial port is now available.

Run command does not close communication between Matrix-2000™ and VisiSet™, and causes Matrix-2000™ to enter Run Mode. In this case the reader output messages are displayed on the VisiSet™ terminal and the statistics are displayed in the Statistics window (Statistics enabled).

8.4.1 Edit Reader Parameters

The Parameter Setup window displays the configuration parameters grouped in a series of folders. Each parameter can be modified by selecting a different item from the prescribed list in the box, or by typing new values directly into the parameter box.

By right clicking the mouse when positioned over the name of a specific Parameter or Group, a pop-up menu appears allowing you to directly manage that particular parameter or group.

You can **View the Selected Value** for each parameter.

You can **Restore the Default Value** of each parameter or of all the parameters of a group.

Get Properties gives information about the parameter in the form of a pop-up hint that describes the default value and the range/list of valid values.

The **Short Help** gives information about the parameter in the form of a pop-up hint.

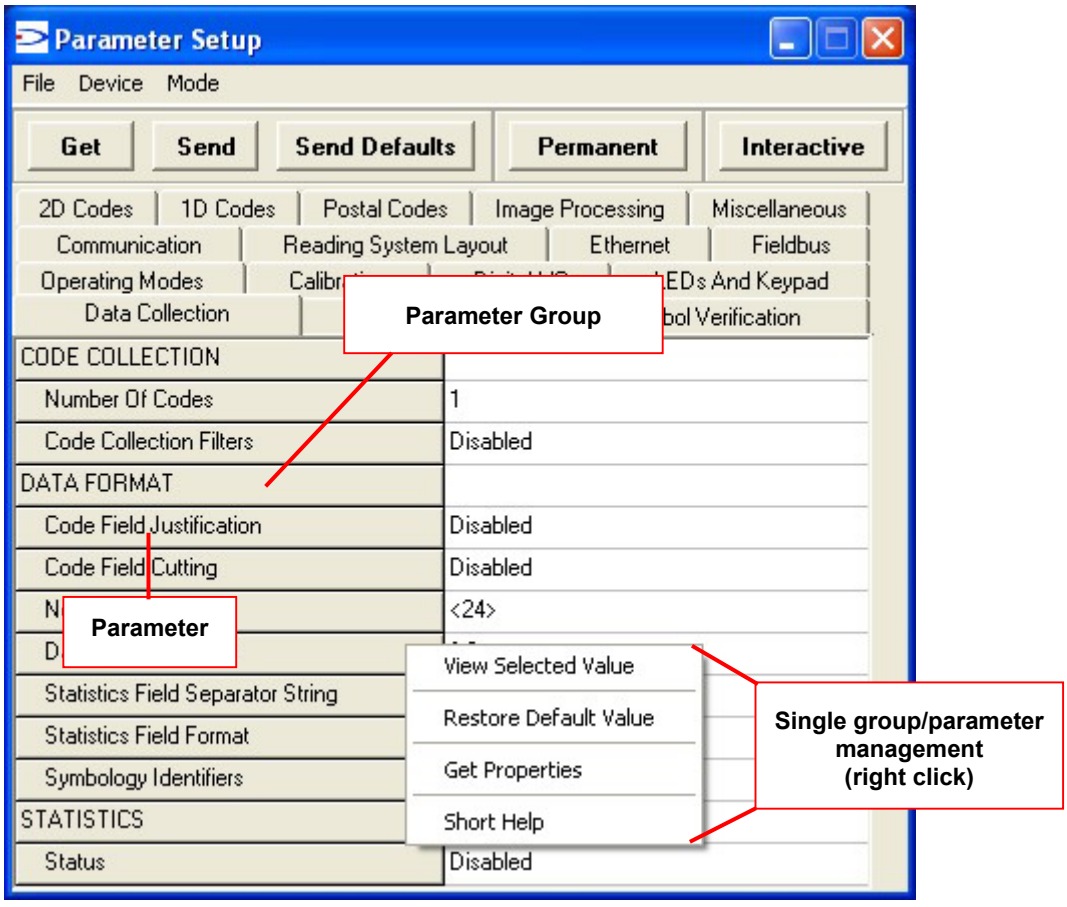


Figure 99 - Editing Parameters

Parameters to verify/modify:

❑ Operating Mode	Sets the parameters which customize the reader operating mode starting from three main modes: One Shot: acquires a single image based on the selected value for the Acquisition Trigger and Acquisition Trigger Delay. Continuous: continuously acquires images with a rate up to the maximum allowable frame rate per second for the given sensor depending on the decoding time and the Region of Interest settings. Phase Mode: acquires images during the reading phase depending on the selected value for the Acquisition Trigger and Acquisition Trigger Delay. The Reading Phase-ON and Reading Phase-OFF events mark respectively the beginning and end of the reading phase.
❑ Calibration	Calibrates the acquisition parameters to maximize the reading performance (see par. 8.4.3).
❑ Communication	Configures the parameters relative to each serial port regarding the transmission, message formatting and string receiving. Any change to the VisiSet™ communication port parameters (baud rate, data bits, etc.) is effective as soon as the reader is disconnected from VisiSet™.
❑ Ethernet	Sets the parameters related to the Ethernet interface and to its communication channels.
❑ Fieldbus	Sets the parameters related to the External Fieldbus interface through the CBX500 and to its communication channels.
❑ Reading System Layout	Allows configuring the device according to the desired layout: Standalone, or Master/Slave RS232
❑ Image Processing	Sets the image processing parameters shared by all available symbologies.
❑ 1D & 2D, Postal Codes	Sets the characteristics of the code symbologies to be read.
❑ Data Collection	Defines the code-collection parameters and the output message format.
❑ Digital I/O	Configures the reader input/output parameters.
❑ Match Code	Allows setting a user-defined code and relative parameters to which the read code will be compared (matched).
❑ Miscellaneous	Sets the reader name and the saved image format.
❑ Symbol Verification	Sets the parameters relative to the various specifications in the Standards which regulate code validation.
❑ LEDs And Keypad	Sets the X-PRESS™ LED and Keypad parameters related to their selected Functions: Beeper, Autolearning, Positioning, etc.

When all the configuration parameters are set correctly, save them to the Matrix-2000™ reader by pressing the Send button. See Figure 99.

For successive configuration of other readers or for backup/archive copies, it is possible to save the configuration onto your PC by selecting the **Save Configuration File** option from the **File** menu.

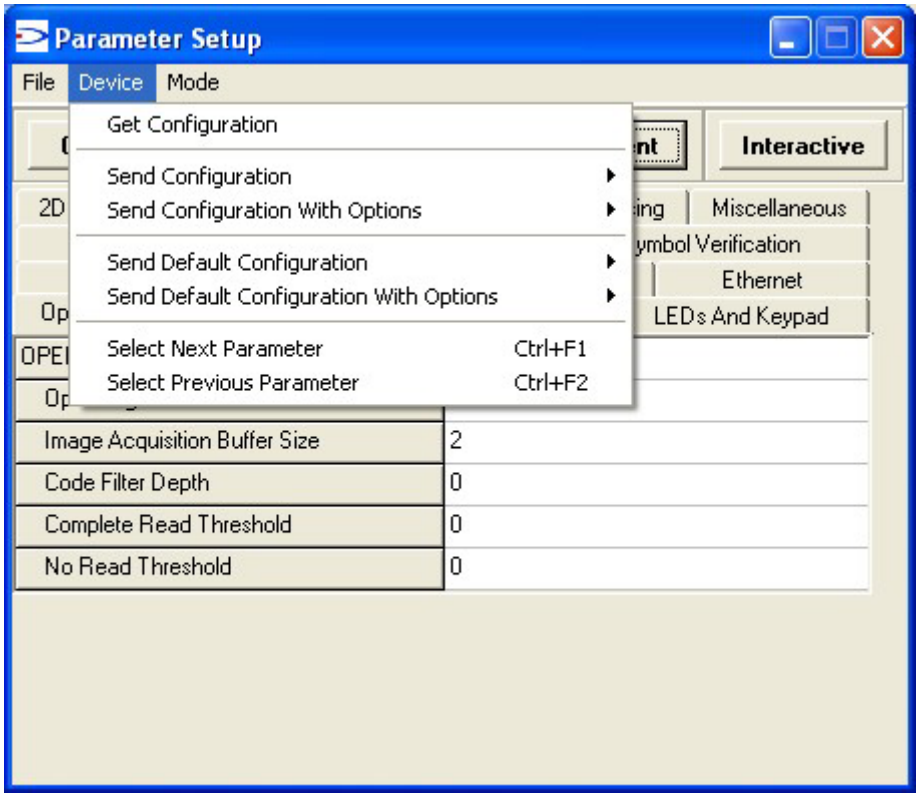
From the **File** menu, you can also **Save Configuration As Text File** for a human readable version.

Load Configuration File (available in the **File** menu) allows you to configure a reader from a previously saved configuration file (.ini).

8.4.2 Send Configuration Options

The device parameters are divided into two main classes, Configuration and Environmental which are effected differently by the Send Configuration and Send Default Configuration commands.

Configuration Parameters regard parameters that are specific to the device. These parameters are influenced by the Send Configuration and Send Default Configuration commands, that is they are overwritten by these commands. The same parameters are modified by the following "Send Configuration with Options" and "Send Default Configuration with Options" dialogs from the Device Menu:



Environmental Parameters regard the device Identity and Position in a Network (Master/Slave RS232, MUX32, Ethernet) and are not influenced by the "Send Default Configuration" and "Send Configuration" commands. This allows individual devices to be configured differently without affecting their recognized position in the network.

The following is a list of the Environmental Parameters:

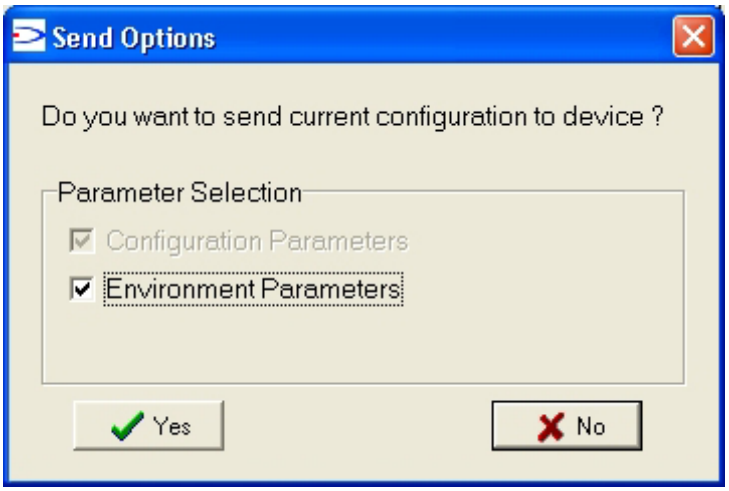
READING SYSTEM LAYOUT
- Device Network Setting
- Number of Slaves

MAIN PORT
- Communication Protocol
- Multidrop Address

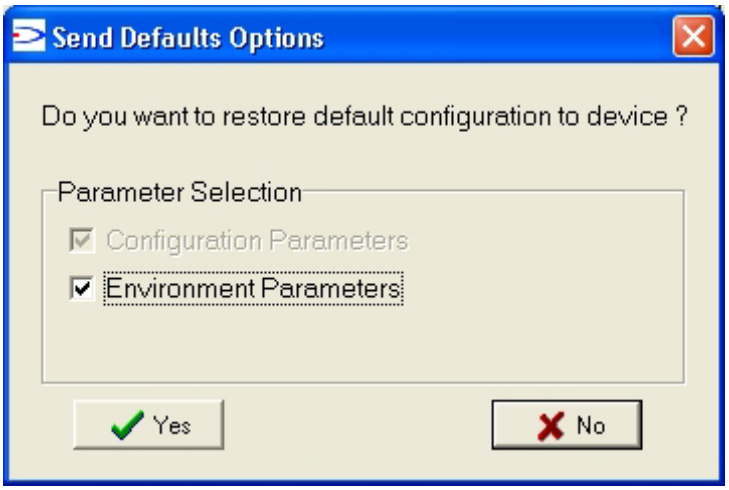
ETHERNET SYSTEM
- Status
- DHCP Client
- IP Address
- Subnet Mask
- Gateway Address
- DNS1 Address
- DNS2 Address

MISCELLANEOUS
- Reader Name
- User Name
- Line Name

For device replacement it is necessary to send the previously saved configuration (both Configuration and Environmental parameters) to the new device. To do this select "Send Configuration with Options" from the Device Menu and check the Environmental Parameters checkbox:



In order to return a device to its absolute default parameters including Environmental parameters, the following Send Default Configuration with Options" dialog must be used:



8.4.3 Calibration

VisiSet™ provides a Calibration Tool to maximize the reading performance by tuning the acquisition parameters and the time of the delayed triggers.

By selecting the Calibration Tool from the VisiSet™ Main Menu (***F***), the following window appears together with the Parameter Setup window:

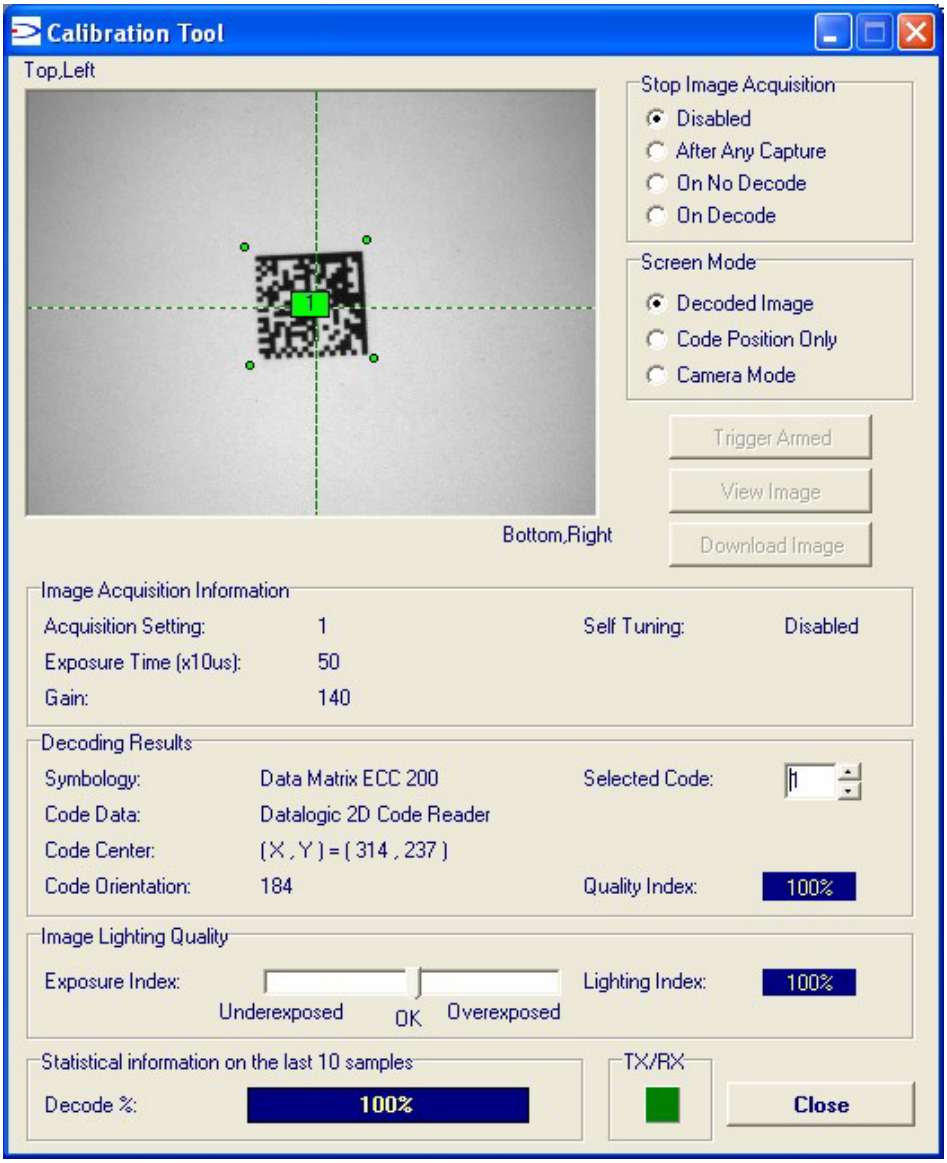


Figure 100 - Calibration OK

This tool provides a "real-time" image display while Matrix-2000™ is reading. It also gives immediate results on the performance of the installed Matrix-2000™ reader.

The Parameter Setup window works in Interactive Mode in order to cause each parameter setting to be immediately effective.

NOTE

If you want to save the temporary configuration to permanent memory, you must first close the Calibration Tool window. Then, you must disable the Interactive Mode and select the ***Permanent Memory*** *option from the* ***Send Configuration*** *item in the Device menu.*

The following examples show some of the typical conditions occurring during the installation:

Under-exposure:

To correct this result it is recommended to change the following parameters in their order of appearance:

1. increase the **Exposure Time (x 10 µs)**
2. increase the **Gain**

NOTE

In general, a longer exposure time corresponds to a lighter image but is susceptible to blurring due to code movement. Exposure time is also limited by the Internal Lighting mode parameter. ***Longer esposure times can be set if the power strobe level is lowered.***

High gain settings may produce a grainy image that may affect the decoding process.

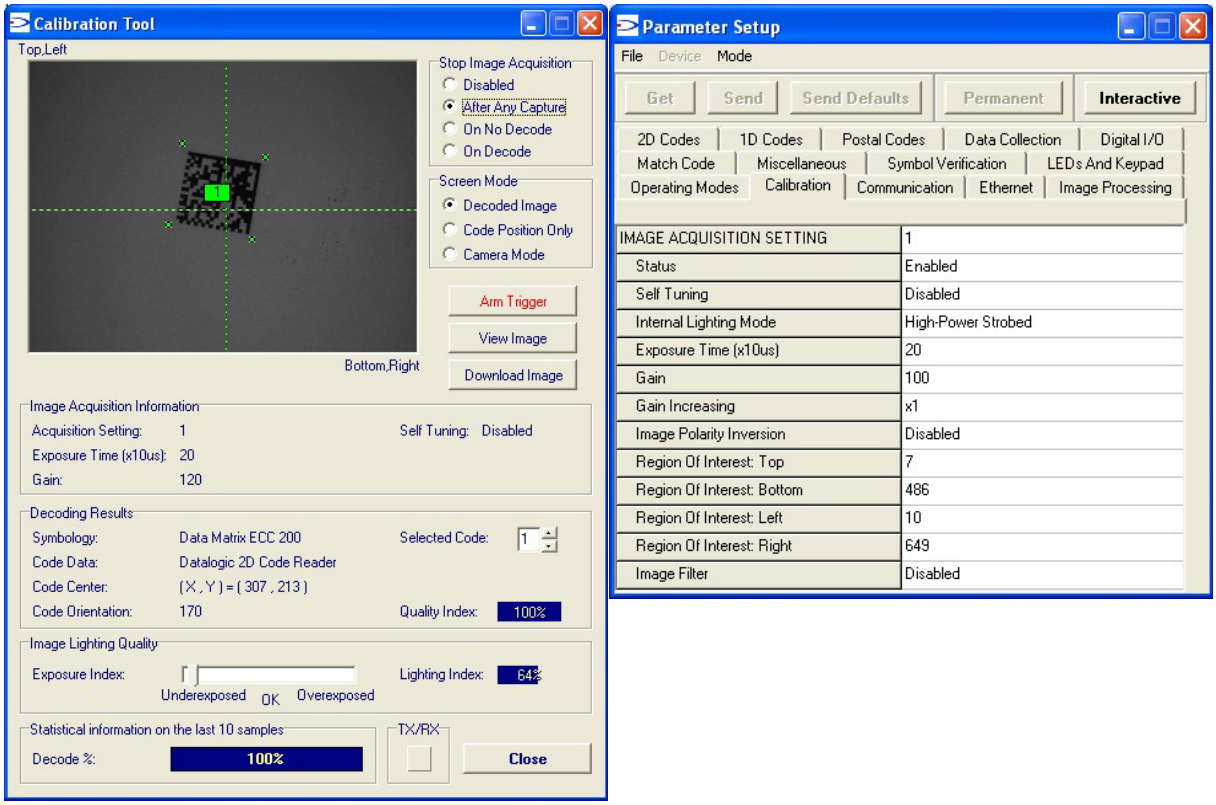


Figure 101 - Example Under Exposure: Too Dark

Over-exposure:

To correct this result it is recommended to change the following parameters in their order of appearance:

1. decrease the **Gain**
2. decrease the **Exposure Time (x 10 µs)**

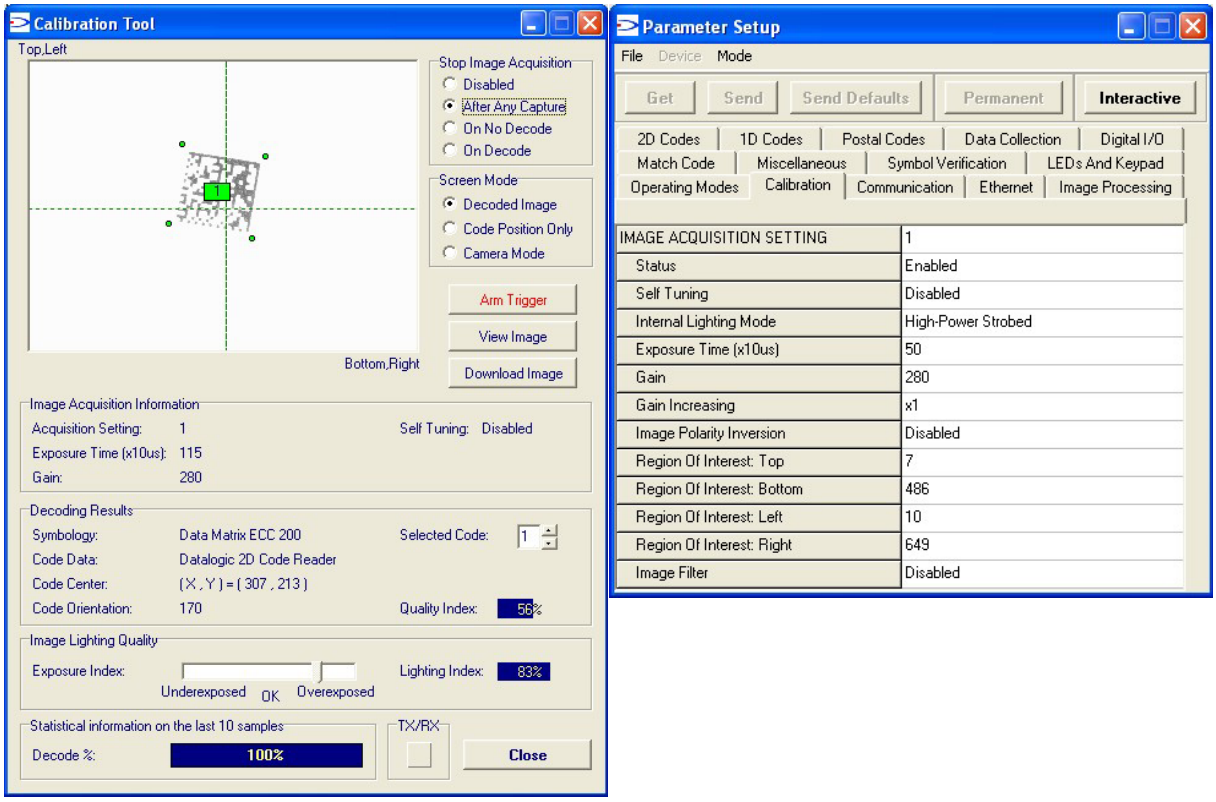


Figure 102 - Example Over Exposure: Too Light

Moving code out of the Field of View:

To correct this result and have the code completely visible in F.O.V., it is possible to follow one or both the procedures listed below:

- reposition the reader
- use the **Acquisition Trigger Delay** by tuning the **Delay Time (x100µs)**

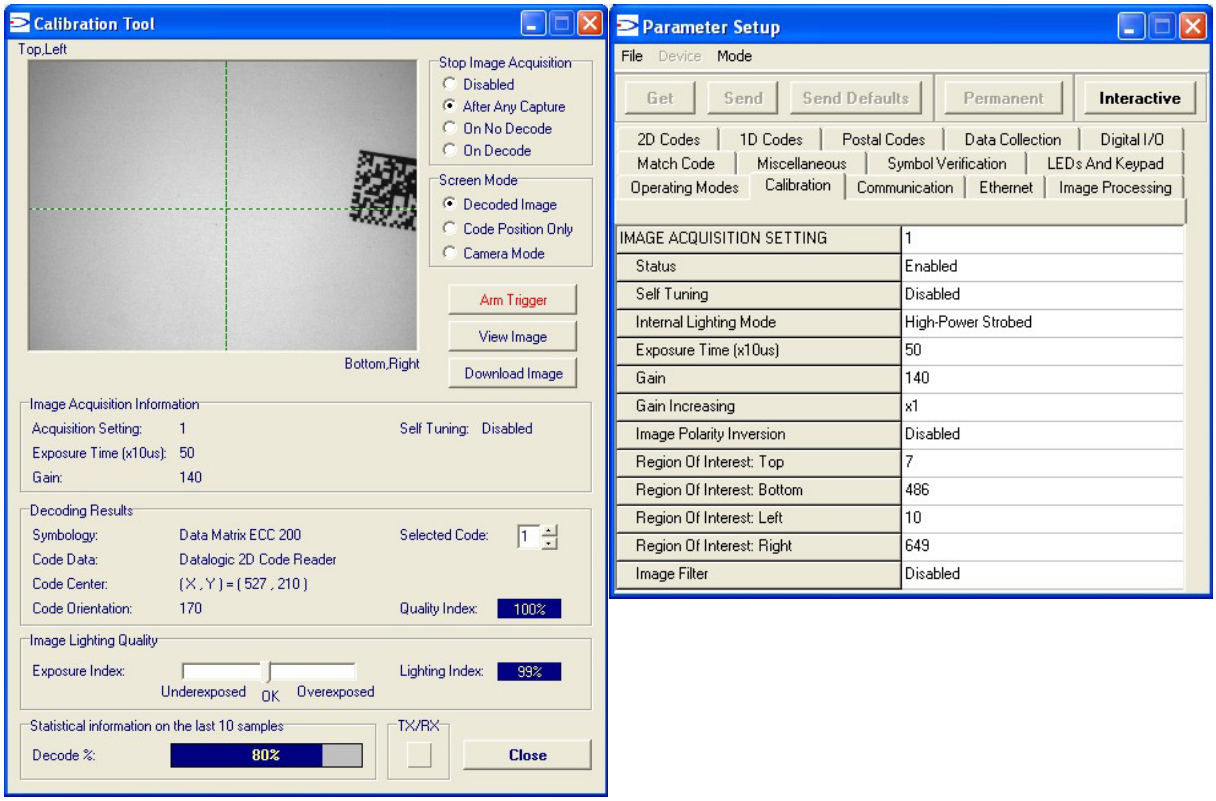


Figure 103 - Example out of FOV

8.4.4 Multi Image Acquisition Settings

When controlled variable conditions occur in the application, Multiple ***Image Acquisition Settings*** (up to 10), can be defined to create a database of parameter groups that handle each specific application condition. This database of pre-defined settings functions cyclically and therefore automatically improves system flexibility and readiness.

For example, an application may have two stable but different lighting conditions which require different lighting options. One Image Acquisition Setting could enable and use an internal illuminator and a second setting could enable and use an external lighting system. These two groups will be used cyclically on each acquisition in order to automatically capture the correctly lighted image.

Image Acquisition Settings are found in the VisiSet™ **Calibration** parameter setup menu. By selecting a different number and enabling its ***Status*** you can define the parameters for a new group.

8.4.5 Run Time Self Tuning (RTST)

Run Time Self-Tuning (RTST) increases Matrix's flexibility in the presence of uncontrolled variable conditions (lighting, code contrast, etc.) by automatically adjusting its acquisition parameters.

Self Tuning Calibration

In the **Calibration** parameter setup menu, the ***Self Tuning*** parameters manage the Image Acquisition Setting parameters dynamically. Self Tuning provides automatic adjustment in run time of different acquisition parameters (*Exposure Time* and/or *Gain*) for each captured image based on calculations performed on previous acquisitions. These dynamic settings will be used instead of the static settings saved in memory.

For more details see the Matrix-2000™ Help On-Line.

Self Tuning Image Processing

In the **Image Processing** parameter setup menu, the ***Self Tuning*** parameters manage the Image Processing and Symbology related parameters. They perform different processing attempts on the same captured image according to the selected Self Tuning Mode parameter value: (*Symbologies Only, Processing Modes Only, Decoding Methods Only, Code Contrast Levels Only, Image Mirroring Only, or General Purpose*).

For more details see the Matrix-2000™ Help On-Line.

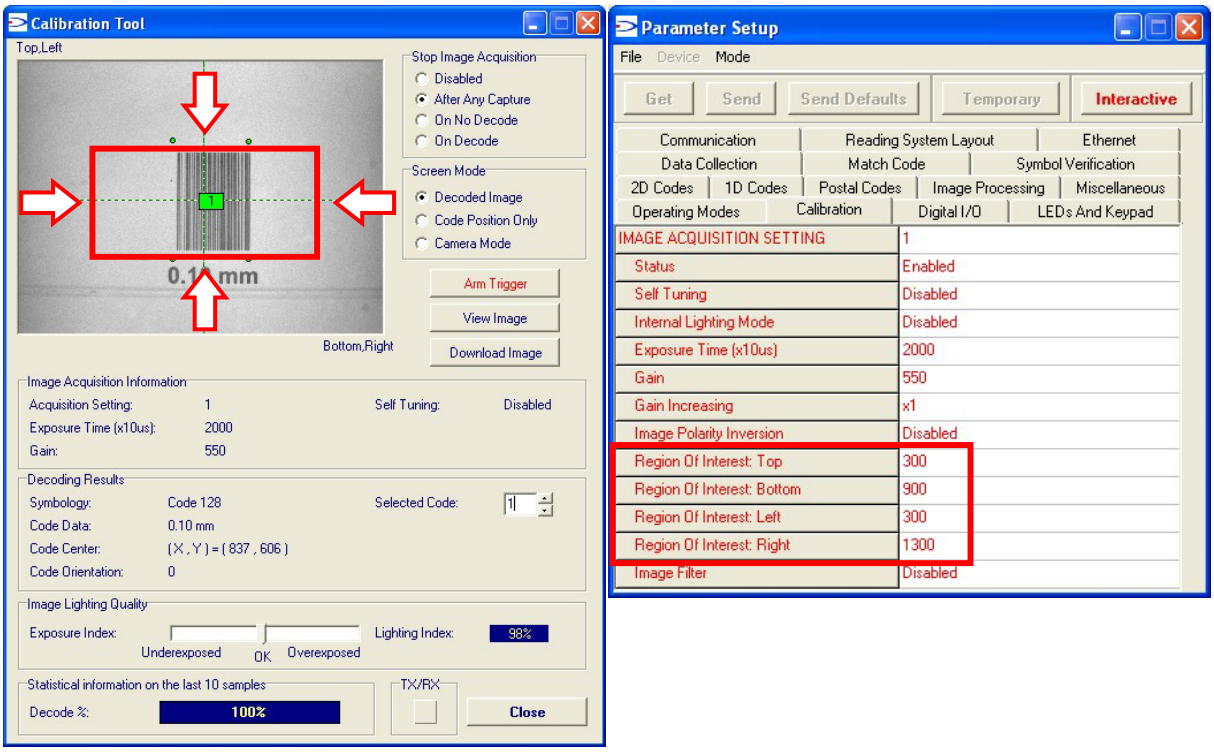
8.4.6 Region Of Interest Windowing

In order to satisfy very high throughput applications, higher frame rates can be achieved using the powerful ***Region Of Interest Windowing*** parameters in the Calibration parameter setup menu.

Region Of Interest Windowing allows defining a region or window within the reader FOV. The Top, Bottom, Left and Right parameters allow to precisely define the image window to be processed, visualized and saved.

The frame rate is dependent on the number of lines (or rows) in the defined window.

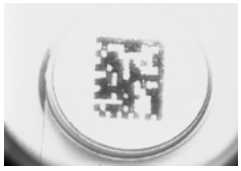
The smaller the window, the lower the frame period and consequently the higher the frame rate. In general the Image Processing time can be reduced by reducing the window dimensions.



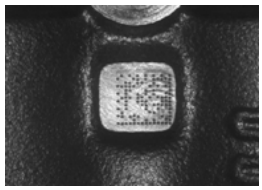
8.4.7 Direct Part Marking Applications

Decoding Method: Direct Marking

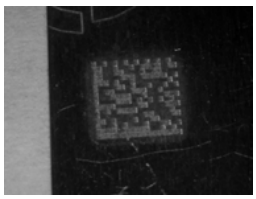
For **Data Matrix** and **QR** code the ***Decoding Method*** parameter selects the decoding algorithm according to the printing/marking technique used to create the symbol and on the overall printing/marking quality. The ***Direct Marking*** selection improves the decode rate for low quality Direct Part Mark codes and in general for Direct Part Mark codes with dot peening type module shapes.



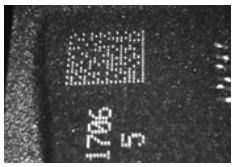
Washed out and Axial Distortion



Dot Peening On Scratched Surface

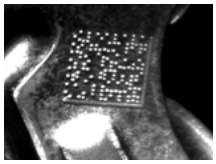


Low Contrast Problem

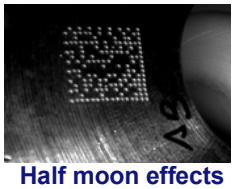


Background Problems

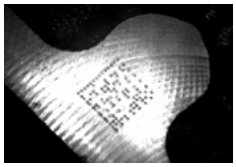
Marked On Curved Shiny Surface



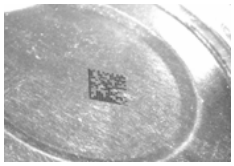
Axial distortion



Half moon effects



Shiny surface, noisy background



Low contrast, noisy background

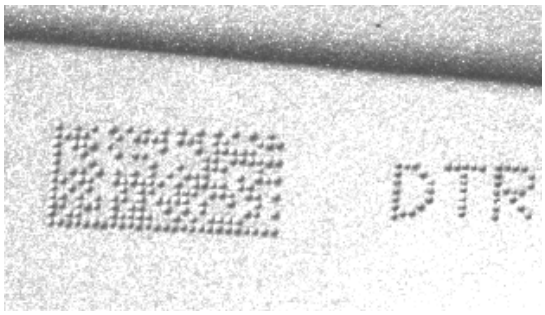
All the previous examples are successfully read selecting the ***Direct Marking Decoding Method***.

Image Filter

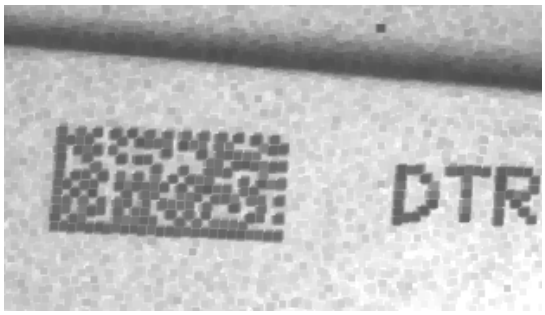
Sets the filter to be applied to the image before being processed. This parameter can be used to successfully decode particular ink-spread printed codes (ex. direct part mark codes).

A different filter can be applied to each ***Image Acquisition Setting***.

The ***Erode*** Filter enlarges the image dark zones to increase readability.



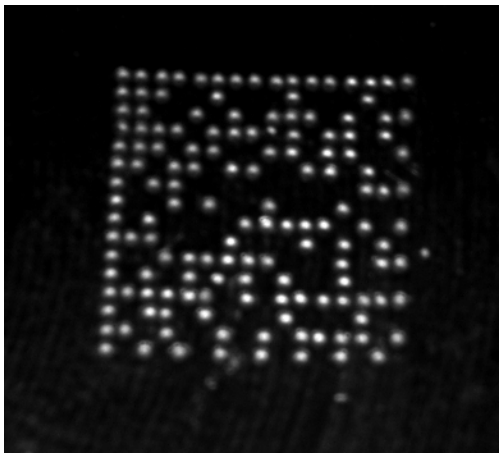
Before - No Read



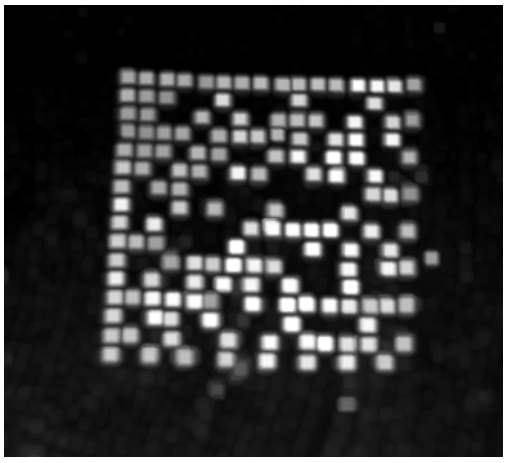
After - Readable

Erode

The ***Dilate*** Filter enlarges the image white zones to increase readability.



Before - No Read



After - Readable

Dilate

The ***Close*** filter eliminates dark areas (defects) in the white zones of the image.

The ***Open*** filter eliminates white areas (defects) in the dark zones of the image.

8.5 IMAGE CAPTURE AND DECODING

By using the **Capture Image** and **Decode Last Image** functions from the VisiSet™ Main menu, you can get information about the image decodable codes in terms of Symbology, encoded Data, Position and Orientation, Decode Time and Code Quality Assessment Metrics.

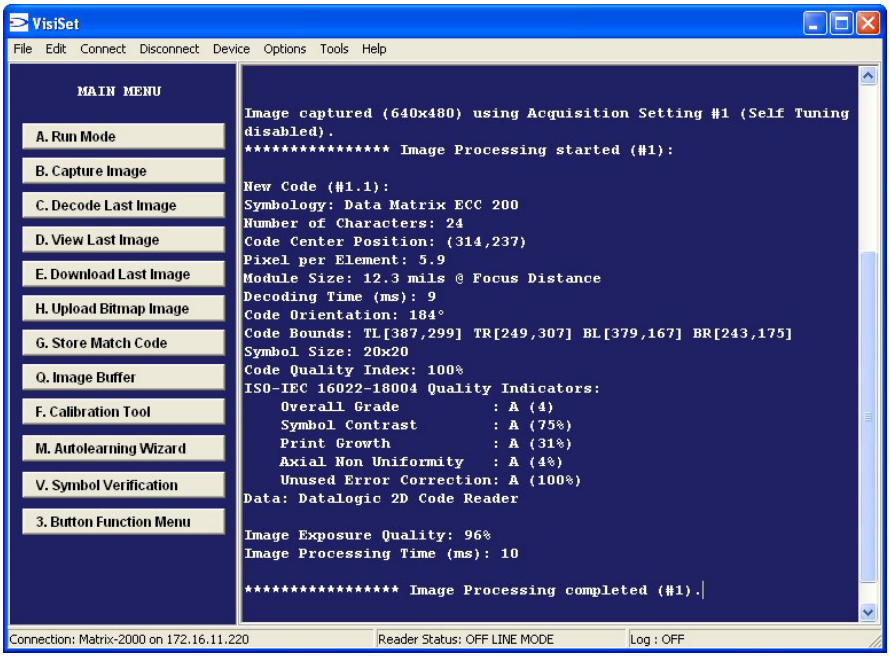


Figure 104 - Capture and Decoding Functions

8.6 STATISTICS

Statistics on the reading performance can be viewed by enabling the Statistics parameter and selecting the **View Statistics** item in the **File** menu. One of three different windows appears depending on the operating mode.
Refer to the VisiSet™ Help On Line for more details.

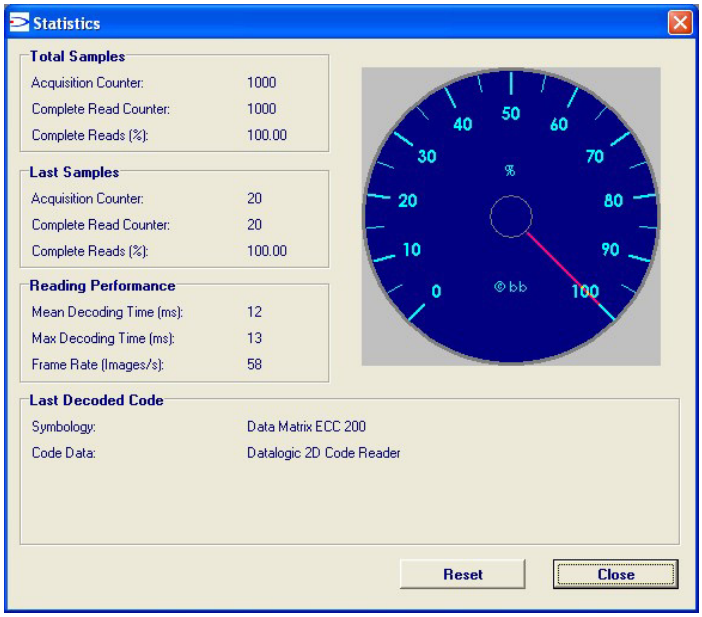


Figure 105 - Code Statistics

9 MAINTENANCE

9.1 CLEANING

Clean the reading window (see Figure A, 1) periodically for continued correct operation of the reader.

Dust, dirt, etc. on the window may alter the reading performance.

Repeat the operation frequently in particularly dirty environments.

Use soft material and alcohol to clean the window and avoid any abrasive substances.

10 TROUBLESHOOTING

10.1 GENERAL GUIDELINES

- When wiring the device, pay careful attention to the signal name (acronym) on the CBX100/500 spring clamp connectors (chp. **4**). If you are connecting directly to the Matrix-2000™ DB25-pin connector pay attention to the pin number of the signals (chp. **5**).
- If you need information about a certain reader parameter you can refer to the VisiSet™ program help files. Either connect the device and select the parameter you're interested in by pressing the F1 key, or select **Help>Paramters Help** from the command menu.
- If you're unable to fix the problem and you're going to contact your local Datalogic office or Datalogic Partner or ARC, we suggest providing (if possible): Application Program version, Parameter Configuration file, Serial Number and Order Number of your reader. You can get this information while VisiSet™ is connected to the reader: the Application Program version is shown in the Terminal Window; the Parameter Configuration can be saved to an .ini file applying the **File>Save Configuration File** command in the Parameter Setup window; Serial Number and Order Number can be obtained by applying the respective command in the **Tools** menu.

TROUBLESHOOTING GUIDE	
Problem	**Suggestion**
Power ON: the "POWER" LED is not lit.	• Is power connected? • If using a power adapter (like PG6000), is it connected to wall outlet? • If using rail power, does rail have power? • If using CBX, does it have power (check switch and LED)? • Check if you are referring to the 25-pin connector or to the CBX spring clamp connectors. • Measure Voltage either at pin **13** and pin **25** (for 25-pin connector) or at spring clamp **Vdc** and **GND** (for CBX).
One Shot or Phase Mode using the Input 1 (External Trigger) or Input 2: the "TRIGGER" LED is not blinking while the External Trigger is switching.	• Check if you are referring to the 25-pin connector or to the CBX spring clamp connectors. • Is the sensor connected to the Input 1 or Input 2? • Is power supplied to the photo sensor? • For NPN configuration, is power supplied to one of the two I1 or I2 signals (A or B)? • For PNP configuration, is one of the two I1 or I2 signals grounded (A or B)? • Are the photo sensor LEDS (if any) working correctly? • Is the sensor/reflector system aligned (if present)? • In the Digital I/O folder check the EXTERNAL TRIGGER or INPUT 2***Debounce Filter*** parameter setting. • In the Operating Mode folder check the settings for ***Reading Phase-ON, Acquisition Trigger*** and ***Reading Phase-OFF*** parameters.

TROUBLESHOOTING GUIDE	
Problem	**Suggestion**
One Shot or Phase Mode using serial trigger source: the ”TRIGGER” LED is not blinking.	• In the Operating Mode folder check the settings for ***Reading Phase-ON, Acquisition Trigger*** and ***Reading Phase-OFF*** parameters. • Are the COM port parameters (***Baud Rate, Parity, Data Bits, Stop Bits, Handshake***) correctly assigned? • In the communication folder, check the settings of ***Reading Phase-ON String, Acquisition Trigger String*** and ***Reading Phase-OFF String*** parameters. • Is the serial trigger source correctly connected?
Phase Mode: the ”TRIGGER" LED is correctly blinking but no image is displayed in VisiSet™ Calibration Tool window.	• Is the Phase frequency lower than the maximum frame rate?
Continuous Mode: the ”TRIGGER” LED is not blinking.	• Verify the correct software configuration settings.
Any Operating Mode: the ”TRIGGER” LED is correctly blinking but no result is transmitted by the reader at the end of the reading phase collection.	• In the Data Collection folder check the settings for the CODE COLLECTION, DATA FORMAT and STATISTICS parameter groups.
Image not clear:	• verify the Focus procedure
Image focused but not decoded:	• verify the Calibrate Image Density prodcedure.
Reading: the reader always transmits the ***No Read Message***	• Perform the Rapid Configuration procedure in chapter **1**. • Position the reader as described in par. 3.3, par. 7.1 and through the VisiSet™ Calibration Tool: – Tune the ACQUISITION TRIGGER DELAY, if the moving code is out of the reader field of view; – Set the Continuous Operating Mode if no external trigger source is available; – Tune the IMAGE ACQUISITION SETTING to improve the code image quality; – Check the parameter setting in Decoding, 2D Codes, 1D Codes, and Postal Codes folders; – View the full resolution code image to check the printing or marking quality.
Communication: reader is not transmitting anything to the host.	• Is the serial cable wiring correct? • If using CBX, be sure the RS485 termination switch is OFF. • Are the host serial port settings the same as the reader serial port settings? • In VisiSet™ Digital I/O folder, "COM" LED can be configured to indicate MAIN COM port TX or MAIN COM port RX.
Communication: data transferred to the host	• Are the host serial port settings the same as the reader serial port settings?

TROUBLESHOOTING GUIDE	
Problem	**Suggestion**
are incorrect, corrupted or incomplete.	• In VisiSet™ Communication folder check the settings of Header and Terminator String parameters. • In VisiSet™ Data Collection folder, check the settings of DATA FORMAT parameter group.
How do I obtain my reader Serial Number?	• The reader Serial Number consists of 9 characters: one letter, 2 numbers, another letter followed by 5 numbers. • The reader Serial Number is printed on a label that is affixed on the bottom case near the reading window. • The Serial Number can also be obtained by selecting Tools/Get Reader Serial Number from the command menu in VisiSet™. A dedicated window will appear.
How do I obtain my reader Order Number?	• The reader Order Number consists of 9 numbers. • The reader Order Number can be obtained by selecting the Tools/Get Reader Order Number from the command menu in VisiSet™. A dedicated window will appear.

11 TECHNICAL FEATURES

ELECTRICAL FEATURES	
Power	
Supply Voltage	10 to 30 Vdc
Power Consumption	0.8 to 0.27 A, 8 W max.; 0.5 to 0.17 A, 5 W typical
Communication Interfaces	
Main	
- RS232	2400 to 115200 bit/s
- RS485 full-duplex	2400 to 115200 bit/s
- RS485 half-duplex	2400 to 115200 bit/s
Auxiliary - RS232	2400 to 115200 bit/s
Ethernet (21xx models only)	10/100 Mbit/s
Inputs	Opto-coupled and polarity insensitive
Max. Voltage	30 Vdc
Max. Input Current	10 mA
Outputs	Opto-coupled
V_{Out} (I_{Load} = 0 mA) Max.	30 Vdc
V_{Out} (I_{Load} = 10 mA) Max.	1.8 Vdc
$P_D = V_{Out} \times I_{Load}$ Max.	170 mW

OPTICAL FEATURES	
Image Sensor	Matrix CCD
Image Format	VGA (640 x 480)
Lighting System	LED array
Wavelength	630 ~ 670 nm
Max. LED Output Power	0.7 mW to EN60825-1
LED Safety Class	Class 1 to EN60825-1

ENVIRONMENTAL FEATURES	
Operating Temperature	0 to 40 °C (32 to 104 °F)
Storage Temperature	-20 to 70 °C (-4 to 158 °F)
Max. Humidity	90% non condensing
Vibration Resistance EN 60068-2-6	14 mm @ 2 to 10 Hz; 1.5 mm @ 13 to 55 Hz; 2 g @ 70 to 200 Hz; 2 hours on each axis
Shock Resistance EN 60068-2-27	30g; 11 ms; 3 shocks on each axis
Protection Class EN 60529	IP64 (sealed connectors required) (Matrix-20XX models only) [1]

PHYSICAL FEATURES	
Dimensions	121 x 73 x 57 mm (4.76 x 2.87 x 2.24 in.)
Weight	380 g. (13.4 oz.)
Material	Magnesium alloy

SOFTWARE FEATURES

Readable Code Symbologies

1-D and stacked	2-D	POSTAL
• PDF417 Standard and Micro PDF417 • Code 128 (EAN 128) • Code 39 (Standard and Full ASCII) • Interleaved 2 of 5 • Codabar • Code 93 • Pharmacode • EAN-8/13 - UPC-A/E (including Addon 2 and Addon 5) • GS1 DataBar (RSS) Family • Composite Symbologies	• Data Matrix ECC 200 (Standard and Direct Marking) • QR Code (Standard and Direct Marking) • MAXICODE • Aztec Code • Microglyph (this symbology requires an activation procedure – contact your local Datalogic Automation distributor for details)	• Australia Post • Royal Mail 4 State Customer • Kix Code • Japan Post • PLANET • POSTNET • POSTNET (+BB) • Intelligent Mail

Operating Mode	ONE SHOT, CONTINUOUS, PHASE MODE
Configuration Methods	Windows-based SW (VisiSet™) via serial or Ethernet link Serial Host Mode Programming sequences
Parameter Storage	Permanent memory (Flash)

[1] Please refer to your local Datalogic Distributor for IP64 Protection class on 21XX models.

CODE QUALITY VERIFICATION	
Standard	**Supported Symbologies**
ISO/IEC 16022	Data Matrix ECC 200
ISO/IEC 18004	QR Code
ISO/IEC 15415	Data Matrix ECC 200, QR Code
ISO/IEC 15416	Code 128, Code 39, Interleaved 2 of 5, Codabar, Code 93, EAN-8/13, UPC-A/E
AS9132A	Data Matrix ECC 200
AIM DPM	Data Matrix ECC 200, QR Code
USER INTERFACE	
LED Indicators	PWR, TRIG, READ, COM, F1, F2
Keypad Button	Configurable via VisiSet™

GLOSSARY

AIM
(Association for Automatic Identification and Mobility): AIM Global is the international trade association representing automatic identification and mobility technology solution providers.

AIM DPM Quality Guideline
Standard applicable to the symbol quality assessment of direct part marking (DPM) performed in using two-dimensional bar code symbols. It defines modifications to the measurement and grading of several symbol quality parameters.

AS9132
Standard defining uniform quality and technical requirements for direct part marking (DPM) using Data Matrix symbologies.

Barcodes (1D Codes)
A pattern of variable-width bars and spaces which represents numeric or alphanumeric data in machine-readable form. The general format of a barcode symbol consists of a leading margin, start character, data or message character, check character (if any), stop character, and trailing margin. Within this framework, each recognizable symbology uses its own unique format.

BIOS
Basic Input Output System. A collection of ROM-based code with a standard API used to interface with standard PC hardware.

Bit
Binary digit. One bit is the basic unit of binary information. Generally, eight consecutive bits compose one byte of data. The pattern of 0 and 1 values within the byte determines its meaning.

Bits per Second (bps)
Number of bits transmitted or received per second.

Byte
On an addressable boundary, eight adjacent binary digits (0 and 1) combined in a pattern to represent a specific character or numeric value. Bits are numbered from the right, 0 through 7, with bit 0 the low-order bit. One byte in memory can be used to store one ASCII character.

Composite Symbologies
Consist of a linear component, which encodes the item's primary data, and an adjacent 2D composite component, which encodes supplementary data to the linear component.

Dark Field Illumination
Lighting of surfaces at low angles used to avoid direct reflection of the light in the reader's lens.

Decode
To recognize a barcode symbology *(e.g.,* Codabar, Code 128, Code 3 of 9, UPC/EAN, etc.) and analyze the content of the barcode scanned.

Depth of Field
The difference between the minimum and the maximum distance of the object in the field of view that appears to be in focus.

Diffused Illumination
Distributed soft lighting from a wide variety of angles used to eliminate shadows and direct reflection effects from highly reflective surfaces.

Direct Part Mark (DPM)
A symbol marked on an object using specific techniques like dot peening, laser etching, chemical etching, etc.

EEPROM
Electrically Erasable Programmable Read-Only Memory. An on-board non-volatile memory chip.

Element
The basic unit of data encoding in a 1D or 2D symbol. A single bar, space, cell, dot.

Exposure Time
For digital cameras based on image sensors equipped with an electronic shutter, it defines the time during which the image will be exposed to the sensor to be acquired.

Flash
Non-volatile memory for storing application and configuration files.

Host
A computer that serves other terminals in a network, providing services such as network control, database access, special programs, supervisory programs, or programming languages.

Image Processing
Any form of information processing for which the input is an image and the output is for instance a set of features of the image.

Image Resolution
The number of rows and columns of pixels in an image. The total number of pixels of an image sensor.

Image Sensor
Device converting a visual image to an electric signal. It is usually an array of CCD (Charge Coupled Devices) or CMOS (Complementary Metal Oxide Semiconductor) pixel sensors.

IEC
(International Electrotechnical Commission): Global organization that publishes international standards for electrical, electronic, and other technologies.

IP Address
The terminal's network address. Networks use IP addresses to determine where to send data that is being transmitted over a network. An IP address is a 32-bit number referred to as a series of 8-bit numbers in decimal dot notation *(e.*g., 130.24.34.03). The highest 8-bit number you can use is 254.

ISO
(International Organization for Standardization): A network of the national standards institutes of several countries producing world-wide industrial and commercial standards.

LED (Light Emitting Diode)
A low power electronic light source commonly used as an indicator light. It uses less power than an incandescent light bulb but more than a Liquid Crystal Display (LCD).

LED Illuminator
LED technology used as an extended lighting source in which extra optics added to the chip allow it to emit a complex radiated light pattern.

Matrix Symbologies (2D Codes)
An arrangement of regular polygon shaped cells where the center-to-center distance of adjacent elements is uniform. Matrix symbols may include recognition patterns which do not follow the same rules as the other elements within the symbol.

Multidrop
A communication protocol for connecting two or more readers in a network with a concentrator (or controller) and characterized by the use of individual device addresses.

Multi-row (or Stacked) Symbologies
Symbologies where a long symbol is broken into sections and stacked one upon another similar to sentences in a paragraph.

RAM
Random Access Memory. Data in RAM can be accessed in random order, and quickly written and read.

Symbol Verification
The act of processing a code to determine whether or not it meets specific requirements.

Transmission Control Protocol/Internet Protocol (TCP/IP)
A suite of standard network protocols that were originally used in UNIX environments but are now used in many others. The TCP governs sequenced data; the IP governs packet forwarding. TCP/IP is the primary protocol that defines the Internet.

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DECLARATION OF CONFORMITY

CE 08

Datalogic Automation S.r.l.
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40012 - Lippo di Calderara
Bologna - Italy

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Matrix-2XXX e tutti i suoi modelli
and all its models
et tous ses modèles
und seine Modelle
y todos sus modelos

sono conformi alle Direttive del Consiglio Europeo sottoelencate:
are in conformity with the requirements of the European Council Directives listed below:
sont conformes aux spécifications des Directives de l'Union Européenne ci-dessous:
der nachstehend angeführten Direktiven des Europäischen Rats:
cumple con los requisitos de las Directivas del Consejo Europeo, según la lista siguiente:

89/336/EEC EMC Directive e (and / et / und / y) **92/31/EEC, 93/68/EEC** emendamenti successivi / further amendments / ses successifs amendements / späteren Abänderungen / succesivas enmiendas

Basate sulle legislazioni degli Stati membri in relazione alla compatibilità elettromagnetica ed alla sicurezza dei prodotti.
On the approximation of the laws of Member States relating to electromagnetic compatibility and product safety.
Basée sur la législation des Etats membres relative à la compatibilité électromagnétique et à la sécurité des produits.
Über die Annäherung der Gesetze der Mitgliedsstaaten in bezug auf elektromagnetische Verträglichkeit und Produktsicherheit entsprechen.
Basado en la aproximación de las leyes de los Países Miembros respecto a la compatibilidad electromagnética y las Medidas de seguridad relativas al producto.

Questa dichiarazione è basata sulla conformità dei prodotti alle norme seguenti:
This declaration is based upon compliance of the products to the following standards:
Cette déclaration repose sur la conformité des produits aux normes suivantes:
Diese Erklärung basiert darauf, daß das Produkt den folgenden Normen entspricht:
Esta declaración se basa en el cumplimiento de los productos con las siguientes normas:

EN 55022 (Class A ITE), September 1998: INFORMATION TECHNOLOGY EQUIPMENT
RADIO DISTURBANCE CHARACTERISTICS
LIMITS AND METHODS OF MEASUREMENTS

EN 61000-6-2, September 2005: ELECTROMAGNETIC COMPATIBILITY (EMC)
PART 6-2: GENERIC STANDARDS - IMMUNITY FOR INDUSTRIAL ENVIRONMENTS

Lippo di Calderara, January 29th, 2008

Lorenzo Girotti
Product & Process Quality Manager